In This Issue *"With the Electrical Contractor and Dealer,"—a department detailing a host of new ideas, facts and figures, which set forth opportunities of organization and co-operation.*

JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 10 SAN FRANCISCO, NOVEMBER 15, 1917 PER COPY, 25 CENTS

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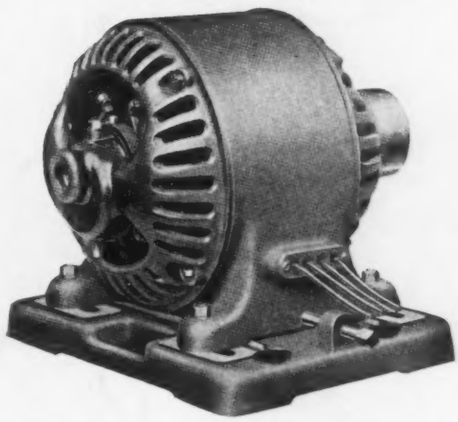

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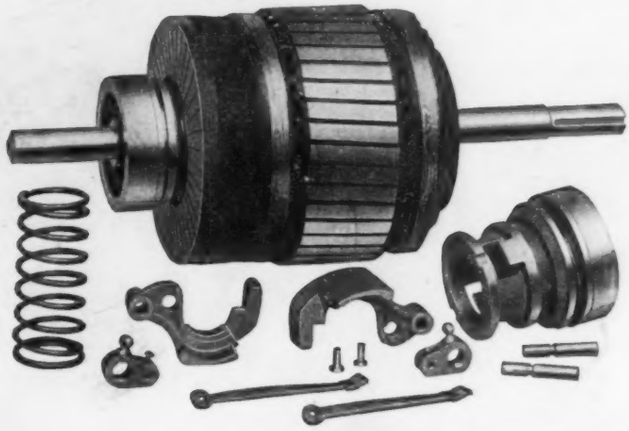

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

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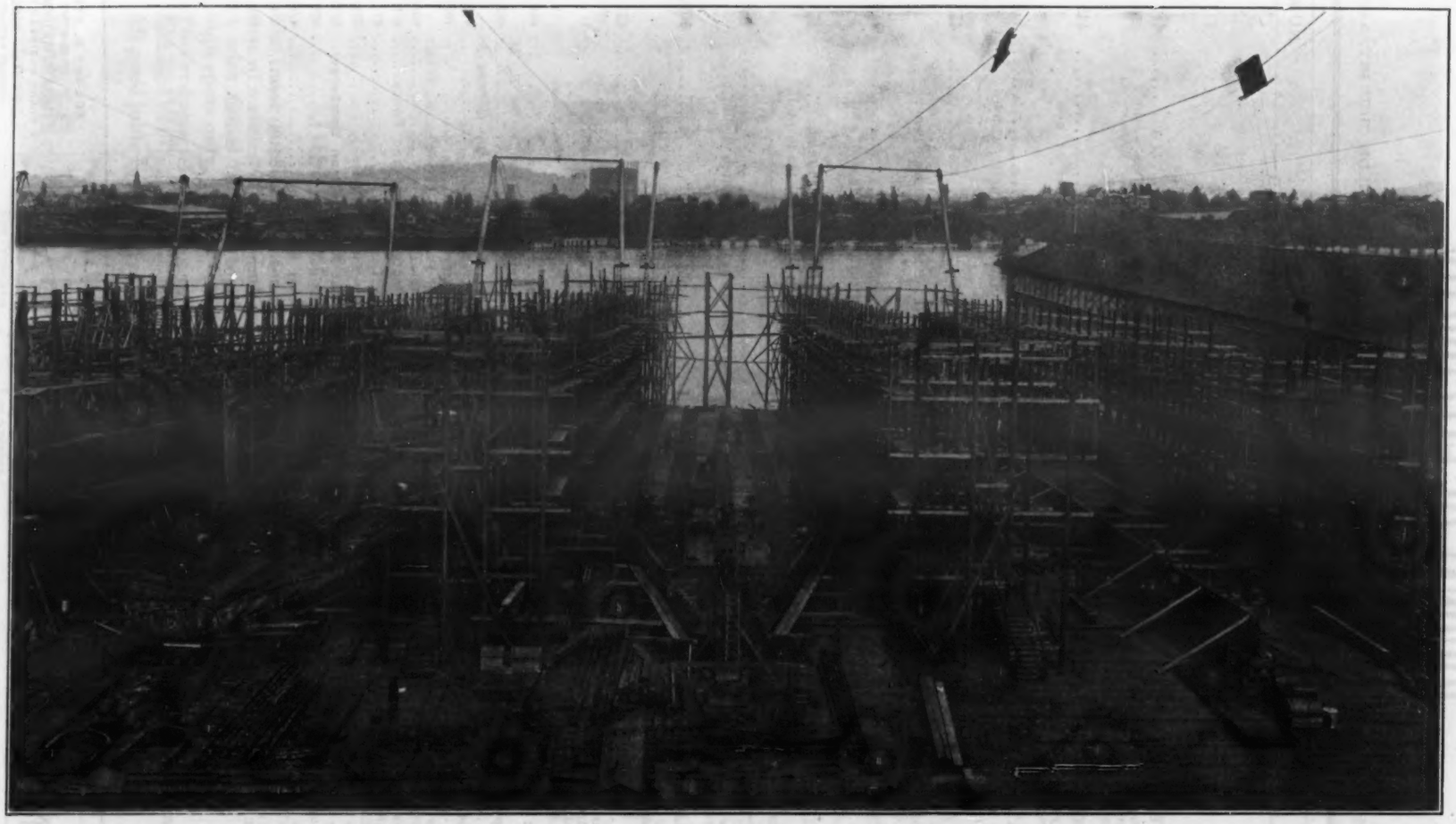

HOW THE WEST IS HELPING TO WIN THE WAR—II

THE unprecedented ship building in the West—an instance of which is shown above from the giant docks along the Columbia—is revolutionizing the industrial and commercial possibilities of this vast region. As a helpful factor in winning the war its possibilities are admitted on all sides. And, when again the soft voice of peace is heard among the nations of the earth, the new industries electrically operated that have been called into existence throughout the West, in order to build these mammoth ships will be so intrenched in the industrial life of the nation as to place this section in the leading position of helpfulness for the upbuilding of the commercial and engineering supremacy of the great Pacific and the countries that line its borders.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

VOLUME XXXIX — SAN FRANCISCO, NOVEMBER 15, 1917 — NUMBER 10

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THANKSGIVING

To thoughtful men of the electrical industry, this period of the year has an unusually impressive significance. A great national crisis has arisen and not only have our brothers and sons gone forth to battle, but the subtle thought of a great industry is being brought to bear upon the solution of a world problem in such a manner that effective results are bound to follow. In this hour of national stress can not we all, then, with bowed heads, forget the seeming perplexing problems ahead and recount the numberless blessings that have fallen to our lot during the past year. With grateful hearts let us face the new year. Gratitude may not bring new blessings, but it helps to keep those we already have.

Why the Contractor's Association

The electrical contractor-dealer of the West is today leading the thought of the nation in this branch of the industry. The present marked activity in every commonwealth of the West, looking to a closer association of men engaged in this field of activity, is to be commended.

An electrical contractor-dealer can not afford to be without the helpful ideas and assistance to be derived by mingling with his fellow associates and thus acquiring the combined impetus resulting from the experience of a thousand men daily engaged in the same line of human effort.

There is perhaps no field of endeavor that presents brighter prospects for the future than that of the electrical contractor and dealer. It is simply surprising to see to what a high stage of efficiency men in this branch of the industry are working out their problems.

Let these ideas be coordinated and disseminated among all contractors and dealers and it is indeed difficult to prophesy the possible outcome for increased efficiency.

By getting together, getting acquainted and pushing ahead, shoulder to shoulder, is the only way that this can be accomplished.

Thus only can the highest efficiency be realized in merchandising, in properly advertising, in acquiring working credits and indeed in realizing the success that is reasonably justifiable.

In many respects the contractor-dealer is a public servant, just as the railroad, gas, electric, telephone and other public utility corporations which serve their respective communities.

In view of the difficult problems ahead that must be solved before the unbalancing of the world's affairs can be readjusted, due to the present world war, and in view of the extremely hopeful results bound to follow by applying the combined experience of a thousand fellow workers, there is but one path open—join the association of electrical contractors and dealers in your community and go in with the zest and enthusiasm that the possibilities of the industry hold for you.

The Zone System a Just One

It is with considerable interest that men of the West have been following the editorial appeals of certain Eastern publications in their loud disapproval of the Zone system of mails recently introduced as a war tax measure.

In brief, this system establishes certain definite zones in which rates for mailing purposes are to be effective, the rate increasing as the distance from the home office increases.

The loudest sounding argument that these papers advance is that the zone system will encourage sectionalism and will tend toward the development of a disrupted or at least of a non-unified national life.

The fact remains, however, that the reverse will be true. Too often has natural expression, trying to assert itself in other sections of the country, been thwarted in its contribution to the nation—an expression that might otherwise prove most helpful and original.

Under the Zone system, that which is of truly worth while value will reach the outermost confines of our national bounds and at the same time encouragement is given to the newer sections of the country to develop ideas and expression that more conservative communities might otherwise thwart. In a word, the Zone system of mails, instead of promoting sec-

tionalism, will have a tendency to revitalize our national life.

A Proposed Plan for Unified Action

Electrical men in the West, in all branches of the industry, were among the first to realize that the day for plotting by groups against other groups in the industry has long since past. Hence it is that co-operation has become the symbol for unified work among manufacturer, jobber, central station and contractor-dealer.

The passing of intrigue, as it may be termed, is in full accord with the spirit of the times. In its last analysis the present great world war of democracy against autocracy is in fact but the struggle for expansion of this same principle of co-operation to an enlarged use so as to embrace all mankind.

So broadcast has this spirit of open-mindedness and shunning of the underhand plotting for the above-board play taken hold of men of the industry in the West, that today another great step forward is about to be taken that will still further advance this policy of mutual helpfulness.

In practically all commonwealths of the West there is current a desire to study the fields of usefulness of all branches of the industry and see how they may be best made to blend one with the other.

Especially are the leaders in thought for the Pacific Coast Section of the National Electric Light Association to be commended for the proposal of the plan whereby a sum of money is to be raised to make a careful and far-reaching study of this problem.

It is proposed to employ a man of the highest educational attainments, one who is familiar with electrical men in this section and who can go out through this territory and study first hand the various problems that are before the contractor-dealer, the central station, the jobber and other branches of the industry. This man, chosen for his tact and for his familiarity with all phases of the problems that now confront the industry in the West, should prove of inestimable service in promoting unified action.

The plan is an excellent one and merits the support of all branches of the industry.

The Last New West

Twenty-five years ago this country was virgin territory to the dealer in electricity and electrical wares. To be sure, he was hampered by the awkward appliances and expensive apparatus of a beginning industry but in spite of these things, with any sort of business ability, he was bound to succeed for electricity itself carried him with it in its tide of favor. The contractor dealer and the central station man who must today face their problems of competition and overlapping often enough look back upon this period as one of the Golden Days. What if they could start again with the improved product they handle today, with the knowledge they have of its applications and selling qualities?

Of course, it is useless to wish for the impossible and the pioneer days of this country in electrical matters as in others are fast becoming memories. The enterprising men of Europe, however, and to some extent of our own country have begun to discover that the way to find a frontier is to move to a new land and more and more they have been developing their trade with South America, with the Orient, exploiting new fields with all the advantages of modern methods among a people just awakening to the wonders of an electrical age.

American trade has hitherto confined itself largely to its local opportunities. Capital has not been ready to dare investment abroad, our banks have not developed facilities of exchange nor our government permitted the commercial encouragement of trade combinations which have so materially assisted foreign business elsewhere. With no great degree of regret we have seen opportunities slip by us.

Today we are in a peculiar position. At a day's notice, Germany was withdrawn entirely from competition. England soon found that her capacity was taxed to the uttermost to meet her internal demands. These newer — and older — countries turned to the United States to meet their needs. Not only did opportunities await our trade — they came and asked us to help them out. The records of increased trade with China and Russia, with South America, with Australia and New Zealand are testimonies to the new conditions. The recent action of the government in withdrawing trade investigators from European countries and concentrating on the Americas and Asia is significant recognition of the present situation.

The interesting part of all this is that it is the West which is particularly involved. It is in the countries which border the Pacific that the greatest new developments are awaited—and there is no reason why the electrical manufacturers and dealers of the West should not have a share in the growth. With this issue a review of certain of the current problems and possibilities in foreign trade is presented. It is worthy your study—for opportunity is surely knocking at the Pacific's Open Door.

Effective Hydro-electric Legislation in Sight

Notwithstanding the oft-repeated warnings of those who foresaw the danger, the whole country is today suffering from a power shortage. Coal and oil sadly needed for other purposes are being burned to generate steam power while unused water power is running to waste. This is one of the greatest crimes for which posterity will blame us.

But the past, like the unused water, is gone forever. To deprecate its mistakes is useless except as a means for avoiding them in the future. The need for effective power legislation still exists.

The Shields bill and the new Myers bill safeguard the public interest and provide inducement and protection sufficient to attract private initiative and investment. Their speedy enactment at the December session will do much to relieve the present intolerable situation.

The Shields bill has to do with the development of water power on navigable streams. Its provisions have been discussed so frequently in these columns as to require no further comment now, especially as they

are quite similar to those of the Myers bill which was introduced at the close of the last session.

The Myers bill is an improvement on the Walsh bill, which was designed to accomplish the same purpose, and apparently it has a stronger political backing. It provides for a fifty-year irrevocable lease of the public lands necessary for the development of water power at a rental which "shall not exceed the sum of twenty-five cents per developed horsepower per year for the actual power sold." At the expiration of the lease the Federal government may either take over the entire system, or a severable and complete unit thereof, at its "fair value," or may again lease it, giving preference to the original developer. Half of the money derived from rentals is to be paid to the State within which the power is generated and half to the U. S. reclamation fund. Proportionate charges are provided when only part of the area occupied by the power development is on the public lands.

Both bills represent a compromise. The men who are able and willing to develop the needed power have conceded much more than those who have tried to prohibit such development. Yet it is hoped that enough incentive is left to attract the capital essential to build the dams, power houses and transmission lines necessary to place the water power at the people's service.

The first requisite for favorable Congressional consideration is unanimity of thought and action on the part of the Western people and their Congressional representatives. The question is largely one of Western concern. The West can have what it wants if it will only agree upon what it wants. Consequently everybody should get behind these bills and urge their Congressmen to do likewise.

The Army Behind the Army

That the necessary quota of men for the Enlisted Ordnance Corps of the National Army be brought to its full strength is a matter of great importance at the present moment. While in the West skilled men are being developed along slightly different lines from their brothers in the East, still this very fact emphasizes the importance of Western men contributing a just portion to this very necessary branch of governmental service.

Skilled men in a great many different lines of trade are urgently needed at this time as set forth on another page of this issue. Unless the man in the front line trench has the help and skilled co-operation of specialists behind him his work is seriously hampered. Then, too, it is to the best interest of the nation that each man does the work for which he is best fitted, thus saving the government a long period of instruction, and also greatly enhancing his own chances for advancement.

A great many men who are experts in their lines will wish to make a sacrifice for the government and take less pay to become non-commissioned officers in the Ordnance Corps of the National Army. The Ordnance Corps has been called "The Army behind the Army." And the West will never be found wanting in being behind any army that is behind the army of this great nation.

American Electrical Trade with Canada

American electrical apparatus is gaining rapidly in popularity the world over. A compilation by the National City Bank of New York shows that the value of electrical machinery, appliances and instruments exported from the United States in the fiscal year 1917 aggregated more than fifty millions against thirty million dollars in 1916 and six million dollars in 1900.

In view of the closer ties that are fast being formed between the allied nations, it is interesting to note that the engineering and commercial relations of all the Pacific neighbors are each day becoming more interwoven and a closer spirit of co-operative helpfulness engendered. Comment has recently been made in the editorial columns of the Journal of Electricity setting forth the rapidly growing relations of this nature with our far eastern neighbors — Japan and China.

Coming to a consideration of our great neighbor immediately to the north, figures just compiled by the Bureau of Commerce are especially interesting.

An examination of these reports reveals the fact that the United States has practically a monopoly of Canada's import trade in electrical apparatus. Out of total imports valued at $6,342,490 in the fiscal year ended March 31, 1917, the United States supplied $6,149,342 worth; in the fiscal year 1916 the corresponding figures were $4,896,106 and $4,640,096; in 1915, $6,035,689 and $5,137,382; in 1914, $8,924,314 and $7,505,244; in 1913, $9,104,540 and $7,613,567. (In the last-named year the United Kingdom supplied $1,188,079 worth of the imports.)

While for the years 1913 to 1915 the United States was the Dominion's best customer for Canadian-made electrical apparatus, its purchases during 1916 and 1917 did not keep pace with the expansion of the export trade in such articles.

Thus it is seen that the future holds in store a brilliant outlook for ever-growing closer relations in engineering and commercial matters with all our Pacific neighbors.

And in the contemplation of this fact, it must be borne in mind that only by the everlasting propagation of the co-operative spirit, devoid of domination, can the ultimate goal of peace and mutual helpfulness be profitably set up among all our Pacific neighbors.

THE NEW JOURNAL SERVICE: The current problems of the electrical industry in the West are largely concerned with those of the contractor-dealer. It is with unusual pleasure that announcement is here made of a series of papers that are to appear in the columns of the Journal of Electricity under the authorship of Albert Elliot, the well-known attorney of San Francisco. Mr. Elliot has in recent months proven an able analyst of problems in the electrical industry throughout practically every commonwealth of the West. Indeed in nearly every electrical convention of the current year he has been assigned the leading place at the banquet program. The series will begin with the issue for December, 1917. His terse discussions of credits, of merchandising relations with the central station, of law with reference to the contractor-dealer, and a dozen other subjects should prove of timely interest to men of the industry throughout the West.

A new Service Department has been established in offices of the Journal of Electricity for the convenience of those who have inquiries to make, and all questions, reports of any mistake in address or delay in delivery, matters of employment, and the like, should be addressed to this department.

NEW INDUSTRIAL RECORDS ON THE PACIFIC COAST

BY CLOTILDE GRUNSKY

(Electricity continues to play the leading role in the marvelous commercial and industrial growth of the West. First came the giant power plants, now follow industries in electrical manufacture that are surpassing in wonder and efficiency accomplishments hitherto attained. Men in every branch of the electrical industry, desirous of keeping abreast of the times, should familiarize themselves with these new and interesting records. Take the lamp manufacture as an instance. Do you know that your customers are wondering however they managed to get the wire inside a 'bulb' whose base is too small to receive it, how the vacuum on the inside is achieved, how it is possible to make anything as fine as a tungsten wire? The marvel of these things is to be explained by a visit to the Oakland Mazda Lamp Division of the General Electric Company — but only to be succeeded there by new wonder at the successful handling of the extremely delicate processes.—The Editor.)

THE BUTTON MACHINE

Fine point gas flames are used throughout where the glass must be heated and molded to shape. This machine measures the stems and forms knobs at the top and bottom.

WITH its various world records in dams and power lines, the West may fairly be said to be the great center of electrical power development in this country. We have hitherto been willing to grant the great achievements in the manufacturing side of the industry to the East — but with the recent impetus along all lines of work and the particular advancement in electrical needs, the West is coming more and more to the fore. The growing ship building industry has fostered the development of many subsidiary works to supply electrical machines and products necessary to the process. New processes and demands are giving rise to new factories particularly along the coast from San Diego to British Columbia.

Not the least important of our electrical industries is that involved in the great mazda lamp divisions of the General Electric company. The metal ingredients, glass globes and raw material of the process are the product of factories in the east, none of this work being done west of St. Louis—but there are 16 or 17 establishments in different parts of the United States which handle the assembling of these lamps, more truly the manufacturing part of the process. One of the largest and most efficient of these is the Mazda Lamp Division of Oakland.

To any one used to factories which handle great bars of steel or heavy timbers, this will seem an entirely different sort of an establishment—hardly a factory at all in their sense of the word. And indeed the great interest of the works lies in the extreme delicacy of the problem. The handling of the fragile glass containers through heat and cold, the wiring of the lamp with a filament so fine that it would take at least two of them to make the thickness of a human hair, the managing of all this with a more or less changing corps of workers without a breakage bill which would preclude all hope of profit—the solution of such problems as these makes the record of a successful establishment such as that of the Oakland division a history of real achievement.

There is hardly an industry which is its parallel in the sureness and delicacy of touch required. In contrast to the physical strength and mechanical skill demanded of the usual factory worker, the need here is for quickness, deftness, nicety. It is not surprising therefore that of the 300 or more employees, about 250 are women. Indeed, aside from the managing and supervising (of which women also have some share) the entire process is in women's hands except for the repairing of machines, loading of trucks and heavy mechanical work.

Many steps are involved in the actual process of assembling a lamp. The glass globes, which form the basis of the product, arrive in large cartons from the east and are first unwrapped, placed in racks, washed and dried as a preliminary step. Grease and other accumulations are removed by a dip in a dilute solution of hydrofloric acid — and then a final bath in fresh water renders the bulbs ready for use.

The first step in the actual manufacturing process consists in the preparation of the various parts which go to make up a lamp. Glass tubing of varying sizes is used to make the base on which the filament is supported, the central shaft and later also in the last process of exhausting the air. This is now cut on an emery wheel into the desired lengths — a very exact process which requires long practice and skill in handling.

The larger of these tubes is next passed on to a 'flange' machine which heats the lower end of the tube and spreads it mechanically into a flange, later to fit

THE MAZDA LAMP WORKS OF OAKLAND

Owing to the extreme delicacy of the operations involved, the work is done almost entirely by women. The new factory is now being erected on the site of the garden shown here and a new garden is being planted.

into the base of the lamp. The greatest skill is required in the adjustment and handling of such machines as the slightest defect in the glass, although not apparent at the time, may later cause the discarding and wastage of the lamp in the last process.

Long strips of the cane glass are converted in the next process into the central shaft of the lamp by a "button machine" which by the application of heat and pressure, mechanically forms 'buttons' at top and bottom and cuts the glass into the desired lengths.

The process of stem making combines these two with the insertion of the lead-in-wires. When it is realized that the delicate glass and wire parts must be re-handled two or three times to each process and this at great speed, the magnitude of the problem is begun to be realized. The workers on some of the more complicated processes have attained records of 5000 lamps a day.

WINDING THE TUNGSTEN WIRE

The wire is wound on flat spools which bend it at the proper points to later fit exactly on the stem supports. All of it is finer than the thickness of a human hair.

The "spidering" machine is the next to take up the lamp. This work of adding the hooked arms at the top and bottom of the stem which are later to support the fine tungsten wire was formerly done by hand but a machine has now taken over the more delicate parts of the work. It must be remembered that machinery is continually being improved along these lines. Mazda lamp manufacture is young in the years which it can number, but old in the stages of improvement through which it has already passed.

The wire used for these supports is itself tungsten but of a heavier grade. The size of wire used of course varies for the different types of lamps, the smallest used being that for the 10 watt lamp, which is something like half the size of the proverbial hair line. Diamond dies are used in its production, actual diamonds of large size and first quality being drilled with minute holes through which the wire is drawn. As the diamonds wear they are advanced backward in the process so that the wire at each stage passes through a smaller and smaller hole until its proper dimensions are reached. Although tungsten has something like twice the tensile strength of steel, of course a filament as fine as the one in use requires careful handling which makes the next stage of wiring a particularly delicate one.

Up to this point the wire which was received in spools of the pure metal has been run through a chemical solution, dried and wound on short spools where it is measured and weighed to see that it is of the proper size to use with the lamps in question. A slip here or failure to check the wire used might cause a loss of hundreds of dollars in a few hours. So precise are the motions needed here that particular attention is given to the selection of small girls the movements of whose hands are not so sweeping as those of their taller sisters.

This completes the filament portion of the lamp. The bulb in the meantime has had a small tube welded to the rounded end which later is to be used to exhaust the air. At this stage the two are combined. The bulb is broken off at the proper point by the application of heat at the desired spot and then cold. With great care this is then placed over the filament and the two welded, thus hermetically sealing one end. It is at this point that the base is narrowed to its familiar size.

It is now necessary to exhaust the air and this is done by a mechanical exhaust which raises the temperature in the oven to about 560—600° Centigrade. The effect of the heat in expanding the air and driving it out of the tube outlet combined with a suction applied at the same point at successive stages establishes an effective vacuum. From the last position the projecting tube is annealed and broken off close to the bulb, sealing the lamp completely.

The lamp is now complete but must further pass through an aging process—partly achieved by a machine which runs the lamps from low to high voltage and partly where necessary, by burning on 'aging' racks.

The testing laboratory next establishes the effectiveness of the product mechanically and puts it to the test of amperage and voltage. A photometer is here used in which the image of a standard lamp and of the one to be tested are thrown upon the screen. From the color and intensity, it is possible to determine if the product is standard. A volt and ammeter connected furnish a further check. If the incorrect wire filament should happen to be used it is here that it is detected.

The only remaining process is that of attaching the metal bases. This involves the proper fitting of the wires and the cementing and baking of the parts.

From this stage the lamps are again inspected for some 50 different defects which may creep in, labels

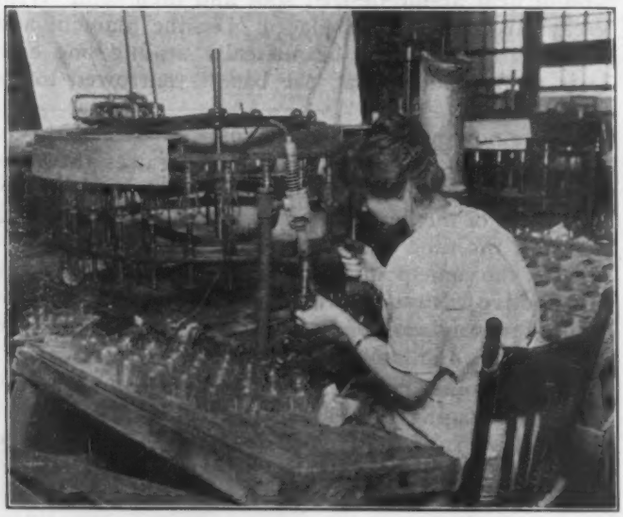
PHOTOMETRING

In testing the lamps a photometer is used together with a volt- and ammeter. This insures the lamp being that which its label proclaims for it.

are pasted on giving wattage, etc.—and the finished product is placed in its wrapping.

It now remains only to box and ship them to the waiting jobbers.

The great problem of the industry, of course, is the reduction of the breakage to a minimum. With this in mind, it is obvious that even a normal turnover in help must mean enormous loss. A new worker



ATTACHING THE BASES

The last process in the manufacture of a lamp. The globe itself is complete by this time, but for commercial purposes the metal base is added.

not only breaks the work handled or turns out imperfect results but also is to be held responsible for the loss which results from her lesser output.

The Mazda Lamp division, however, is fortunate in keeping their help. A most extensive Service Department under the direction of a trained nurse who has complete supervision of the women's interests, provides lunch rooms, rest rooms, medical attention and other conveniences. Cases of sickness are visited at the home, small troubles treated in the model dispensary. The lunch room where a warm lunch is served at a very small cost now seats some 210 and is later to accommodate the entire staff. A piano, a library and a complete set of magazines make the large and attractive rest room a place of real pleasure. There is an ukelele club and a rowing crew among the women—and informal entertainments are encouraged. A full half floor is devoted to this department and in the new building soon to be erected, even more comfortable quarters are to be alloted to it.

TRANSMISSION PROBLEMS IN LONG DISTANCE TELEPHONY

Some of the more important of the problems of transmission to be overcome on a long distance telephone line are pointed out by Bancroft Gherardi of the American Telephone and Telegraph Company in a recent paper, extracts from which are here given:

The long distance telephone problem is largely a line problem. One step in improving the efficiency of a long line is to add to it at suitably determined intervals specially designed induction coils known as loading coils. On the New York-San Francisco line there are about 400 such coils spaced at intervals of about eight miles. These coils diminish the losses in the circuit to such an extent that it will deliver at the receiving end about one-millionth of the energy put in the circuit at the transmitting end. This proportion of received energy is still far below that needed for commercial service.

Further improvements have been made by associating with this line intermediate apparatus known as telephone repeaters and capable of receiving an enfeebled electric current and putting into the line a new electric current derived from a separate source of energy and controlled by the enfeebled received electric current, so that the new current possesses the same characteristics in regard to shape but is greatly magnified. Thus it is possible to receive at the distant end of the circuit energy equal to one-eightieth of that placed upon the circuit at the transmitting end and thereby give good commercial service.

There are many other problems in connection with this line which can not be touched upon within the limits of a paper such as this, but a few may be mentioned. This line is equipped with about 300,000 insulators. Loss of energy must be guarded against at each of these points. For various reasons it is necessary to insert in this line a number of transformers, or, as they are usually called by telephone men, repeating coils. To properly handle the high frequency telephone currents and to make from time to time the necessary changes in impedance, that is the ratio of voltage to current, the telephone transformer problem has been carefully worked out so that there are available for use suitable transformers of high efficiency. To meet the practicable operating conditions and to enable the line to be used, not only at its terminals, but from intermediate points, the line is switched at a number of points where it passes through telephone switchboards. At each of these points the switchboard apparatus must be designed with the utmost care to reduce the losses to a minimum.

Under many conditions it is necessary to place telephone lines in cable. At the present time there is working in the plant of the Bell Telephone System a cable almost 500 miles long extending between Boston and Washington and conecting these places together and with New York and Philadelphia and other important places. By the addition of suitably connected repeaters the efficiency of this circuit 500 miles long is rendered such that one-tenth of the transmitted energy is received, or a very high grade of telephone transmission is given.

Since the telephone receiver is so sensitive it is necessary that arrangements shall be made so that there will not be induced upon the telephone circuit even minute currents from outside sources. Such disturbances are of two general classes:

The first is that which may arise from the induction between one telephone circuit and another.

A second class of disturbance that must be guarded against is that arising from electrical circuits rendering other services, of which electric light and power circuits are typical. The problem of protecting the telephone circuits, particularly open wire circuits, from such disturbances is one of the greatest magnitude.

MEASUREMENT OF ELECTROLYTIC CORROSION

BY B. A. WILLIAMSON

(Electrolysis, working in obscure corners and making destructive inroads in pipe and tanks where least expected, still continues to perplex men of the electrical industry throughout the West. Here is an excellent article on this subject by an author engaged in research on electrolysis who is with the Los Angeles Gas & Electric Corporation. This corporation under the direction of E. R. Northmore, superintendent of distribution, is to be congratulated upon the undertaking of research problems of this nature, the results of which must ultimately prove of so much value to the industry.—The Editor.)

The electrolysis inspector, who is asked to make an examination of a corroded pipe line and an electrolytic survey of the district for the purpose of reporting upon the character and the extent of the corrosion, has a difficult task. The effect of vagrant electric currents in producing corrosion is much the same in appearance to soil corrosion, which is practically always present to a greater or less extent. It is sometimes extremely difficult to determine which of the two factors exercises the greater corrosive effect. Another difficulty lies in the fact that electrolysis engineering has but recently come into prominence and therefore has not been reduced to a scientific basis.

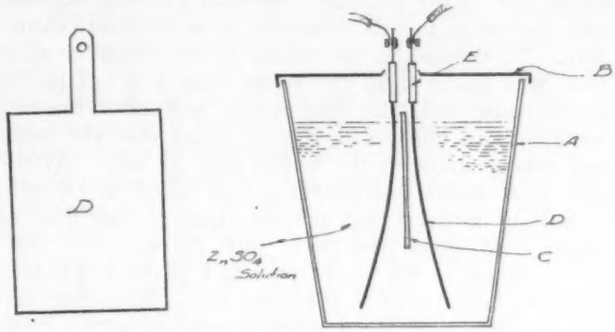
The writer has experienced these difficulties and wishes to present a method of making this class of measurements which is new and possesses certain advantages over those methods described in current literature on the subject.

In a recent technological article by an eminent authority there is described one method of testing, which briefly stated is as follows: After carefully cleaning and weighing two specimens of iron, place them in the soil adjacent to the pipe line under investigation. Connect one of the specimens to the pipe line with a wire. Thus this specimen will be subjected to both soil and electrolytic corrosion and the other specimen will suffer from soil corrosion only. At the end of a reasonable period, remove both specimens and clean of all products of corrosion by a specified electrolytic process, after which re-weigh the specimens and determine the loss of each in per cent. The difference in the loss of the two specimens is ascribable to electrolysis of the vagrant current and the loss of the specimen not connected to the pipe line is that of soil corrosion.

While this method is unique in being the first, so far as the writer knows, of making direct measurement of the rate of electrolytic corrosion of pipe lines, it appears to have certain disadvantages and sources of error. A disadvantage that may be cited is that considerable time, say three months as a minimum, is required to complete a test for the amount of metal corroded in a time of less than this would be so small as compared to the initial weight of the specimen, that any small error in cleaning or weighing would materially affect the result of the test.

A source of error lies in the assumption that the rate of the corrosion is independent of the ratio between the surface and the volume of the specimen. Evidently the specimen of iron in question that must be weighed on a delicate balance will lose much more rapidly in proportion to its weight than will a pipe of commercial dimensions. It has been stated incidentally that a needle will survive soil corrosion only a few weeks. Another source of error is due to the galvanic effect that is experienced when two pieces of metal, dissimilar in composition, are electrically connected and placed in an electrolyte such as the earth. Thus it will be found that there will exist between the pipe line and buried iron specimen a certain galvanic potential, depending upon the dissimilarities of the composition of the iron, soil and the character of contact between soil and iron.

In order to reduce the time required for making a test from three months to as many days the above method was modified as follows: Take a new pipe



ELECTROLYTIC CELL FOR USE IN TEST

A jelly glass and two electrodes of sheet zinc form the basic materials for the test. Errors due to difference in surface area in comparison to volume and difference in the actual composition of the pieces tested are otherwise compensated for.

2½ in. x 18 in. and drive in soil near the pipe line under examination. Construct an electrolytic meter, consisting of two zinc electrodes immersed in a solution of zinc sulphate. Connect one of the electrodes to the pipe line and connect the other electrode to the pipe used as a specimen. Ignoring galvanic effects, if there is electrolysis present due to vagrant current, it will flow through the cell, electrolyzing the corresponding electrode to be discharged from the specimen to the soil. If the pipe line is absorbing current from the soil, it will be discerned by the other electrode being electrolyzed. The quantity of electricity in ampere-seconds that passes may be calculated by weighing the electrodes at the beginning and the conclusion of the test and multiplying the loss in grams by 2967 according to Faraday's Laws. The loss of iron of the specimen in grams may be approximated, assuming an efficiency of corrosion of 100%, by dividing the ampere-seconds by 3445.

In this method, unlike the previous method, there will be no negative result when the pipe is absorbing current. It permits the use of a specimen of size comparable to the practical requirements of the test. It is much easier to wash the dissolved metal from the zinc electrodes than it is to electrolytically remove the oxides, without removing any metal, from the iron specimens. The zinc electrodes are small, weighing

about 10 grams and therefore the loss of one gram would mean a 10% loss, which would be appreciable to the eye. It would be feasible to have electrodes of standard size, which after being used in a test could be filed away, as are meter charts for future reference.

The electrolytic cells may be made at a slight expense in a convenient form as follows: A is an ordinary jelly glass with a tin cover B, in the top of which is cut a slot through which is suspended two electrodes D made of sheet zinc. These electrodes are immersed in a 20% solution of zinc sulphate and are separated at the lower end by a partition of glass C which is cut to fit a central vertical section of the jelly glass. The upper ends of the electrodes are insulated from one another and the cover B by short sections of rubber tubing E. At the upper end of the electrodes the number of the cell is stamped and holes drilled for the insertion of tiny brass bolts by which connection is made to the wires.

Unfortunately this method does not eliminate the error due to the galvanic potential existing between two dissimilar metals immersed in a common electrolyte. To determine the extent of this error, a short pipe was taken from the scrap heap and cut in the center; one end was filed bright and after burying both ends in moist soil, it was found that the rusty end was positive to the bright end .17 volt. At the end of 24 hours this potential had fallen to .04 volt. It will be noticed that the direction of the flow of current was from the rusty pipe through the voltmeter circuit to the bright pipe and in the soil it was from the bright pipe to the rusty pipe. Thus two dissimilar metal specimens, when in contact with a common electrolyte will show a galvanic potential difference of a polarity, such that if the specimens are connected the direction of the current flow will tend to equalize the potential differences.

Judging from the above experiment, the reader might conclude that if the specimen was allowed to remain in the soil for a few days, connected to the pipe line with a wire, the galvanic potential difference would be entirely eliminated, after which a reliable test could be made by inserting an electrolytic cell in the circuit. It was proven that this is not the case by the following manner: A location was selected in an electrolytic field of two car lines near the end of the street where the pipe-line was dead-ended. It was assumed that if the current flowed away from the substation supplying the car lines and toward the dead end of the pipe line, that electrolysis was occurring since the current must be discharging from the pipe line to the soil and vice versa, if the current was flowing in the opposite direction, the pipe line must be absorbing current from the soil. The direction of the current flow was observed by taking the potential drop over the pipe line by means of a Bristol recording milli-volt meter. Short iron pipes were driven in the soil for test specimens and connected to the pipe line through the electrolytic cell, which indicated the direction and quantity of current discharge. After making a number of these check tests, the writer concludes that in cases where electrolysis due to vagrant current is occurring at a relatively slow rate compared to soil corrosion, erroneous results may be obtained by measuring the loss of weight of an unseasoned specimen that is electrically connected to the pipe under examination.

It is believed that a more reliable test could be made by using a disconnected portion of the underground system for a specimen. Thus it is nearly always possible to find a vacant building whose service pipe may be disconnected at the main and at the meter. It would seem that the disconnected service should possess all the desirable points of a specimen. It should be almost entirely free of galvanic potential differences since presumably it is of the same quality of iron as the system of which it is a part, it should have the same amount of surface corrosion and the soil surrounding it should have the same quality and quantity of oxides and gases in solution. By connecting the service to the main through an electrolytic cell, a measurement of the direction and quantity of current could be made in a few days after which the service could be re-connected. Another method would be to insert an insulating coupling in the pipe line near a dead-end after which the electrolysis on the insulated dead-end could be measured by connecting the cell in a jumper across the insulating coupling.

MUNICIPAL OWNERSHIP OF PUBLIC UTILITIES IN LOS ANGELES

(The question of the municipal ownership of public utilities is not one to be lightly decided. Without here commenting on the arguments as presented, the following excerpts from the report of the committee on municipal ownership of the City Club of Los Angeles are submitted as containing matter which must be of interest to both sides.—The Editor.)

In a report on the "Government Ownership of Public Utility Service Undertakings," the committee of that title of the City Club of Los Angeles recommends:

1st. The completion of the purchase, and the development of the required equipment for the entire city electric service;

2nd. Complete the purchasing of all of the remaining water companies;

3rd. Take over, with the least possible delay, the entire equipment of the Los Angeles Gas and Electric Corporation as well as all other gas supplies in the city.

Comparison of American, Great Britain and German Cities

In the 56 largest American cities, the 50 largest cities in Great Britain and a like number in Germany, the public ownership of Water, Gas and Electric supplies in number and per cents are as follows:

OWNERSHIP OF THREE LEADING SERVICE UTILITIES

Country—	No. of Cities.	—Water— No.	P.C.	—Gas— No.	P.C.	—Electric— No.	P.C.	— Total— No.	P.C.
Great Britain...	50	39	78.	21	42.	44	88.	104	69.3
Germany	50	48	96.	50	100.	42	84.	140	93.3
United States...	56	49	87.5	1	1.8	7	12.5	57	33.9
Totals* and %	156	136	87.2	72	46.1	93	59.6	301	64.3

*Total number of utilities for all cities 468.

Ownership of water service by American cities is well established, as 49 of the 56 cities, or 87.5%, now own their supplies. This is ½% higher than the combined average for the 100 cities in Great Britain and Germany.

All of the 50 German cities own their gas supply while only one of the 56 American cities owns its supply.

Ownership of electric service shows that Great Britain cities own 88%, German cities 84%, while the 56 American cities stand at 12.5%.

The total average ownership of these three utilities show that the Great Britain cities own more than double the per cent of American cities, while the German city ownership per cent is nearly three times as much as ours.

NOTES ON THREE-PHASE AND WARD-LEONARD WINDING EQUIPMENTS FOR MINES

The relative advantages of the Ward-Leonard and three-phase systems of electric winding have been discussed before the South African Institute of Electrical Engineers several times and the broad principle has been established, as set forth in the recent proceedings, that either system may have advantages over the other according to the conditions of the wind. So far, the author believes, no attempt has been made to state definitely the limits between which the three-phase system has advantages over the Ward-Leonard and vice-versa.

It is generally acknowledged that the Ward-Leonard system gives cheaper operating costs under plain cylindrical drum-hoists hauling from 3000 ft.

With the three-phase equipment the present limits of the contactor switches limit the size of equipment when it is desired to install about 2000 h.p. at 2200 volts. This is much too small for many of the deep level winding problems that have to be solved on these fields.

Generally speaking, the three-phase equipment will be found economical on straight-forward winds of moderate depths and weights. This holds for Rand conditions where the rope is in general discarded when the factor of safety is reduced to six. For incline shafts the limit of depth will be much greater and will depend upon the angle of inclination.

For greater depths than 3000 ft., probably up to 4000 ft., there will not be much to choose between the two systems, and above this depth the advantage will be with the Ward-Leonard equipment. The reasons for this are, firstly, the unbalanced pull on the drums becomes very great with great depths, needing a large accelerating peak, and, secondly, when nearing the end of the wind the unbalanced pull of the rope is more than enough to pull the skip to the surface and the winder will require reverse power to bring it to rest. Reverse power with a three-phase equipment meaning extra energy from the line, with a Ward-Leonard it will mean energy returned to the line.

For shallow winds up to, say, 1000 ft., the proportion of accelerating time is very large, and it becomes possible to save a large percentage of the power consumption by using a Ward-Leonard equipment, in general sufficient to compensate for the extra capital that is required to install it.

NEW RATE BASIS FOR MUNICIPAL CHARGES

(Here is how the small city of Glendale in Southern California is solving its municipal rate problem. The establishment of a service charge designed to cover the cost of handling a customer's business—the cost of maintaining the service, reading meters, billing, and collecting—constitutes a problem that has perplexed rate fixing bodies throughout the West. The unique departure in this regard in this Southern California city will be watched by men of the industry throughout the West with unusual interest.—The Editor.)

The new rate for the city of Glendale is a complete departure from the usual form of rate inasmuch as they have established a service charge. This is a fixed charge designed to cover the cost of handling a customer's business; that is the cost of maintaining service, reading meters, billing, collecting, etc. This service charge is 50c per month for single-phase current, energy is then charged for at the rate of 2c per kilowatt hour for the first 100 kilowatt hours, and 1c per kilowatt hour for all in excess of 100 kilowatt hours.

There are no restrictions in connection with this rate. Single-phase electricity is sold through one meter for all purposes including light, power, cooking, local heating and water heating at the above rate. It has always been the idea of the Department to avoid complications that result from special limitations, double throw switches, cooking rates, etc. Practically the entire territory is served with gas at 68c per 1000 cubic feet. To fairly meet this competition, a low rate was found to be necessary and to limit the use of electricity by special rules and numerous "Don'ts" did not seem to be the way to build the industry to its proper place.

This rate has been arrived at only after a great amount of study and investigation. It has been carefully figured from every viewpoint based on the number of kilowatts sold in the past year. About the only difficulty found in connection with this rate is the possibility of a too rapid growth. Sufficient margin has been allowed to take care of a more than normal growth.

This Department was established in 1909, when the existing company with 195 customers was purchased by the city. There has been a steady growth since that time until their lines are now serving 3,300 customers. This growth has been accomplished from time to time by reductions in the price of current until with the establishment of their new rate, they are now selling electricity for any or all purposes as low as 1c per kilowatt hour.

The water and light plants are operated together under the management of H. B. Lynch, and have always been entirely self-sustaining. All extensions and improvements, interest, and depreciation and the retiring of the bonds being taken care of out of the income.

This new rate is a decided cut under the previous charges and amounts to a reduction of from one-third to one-half on the majority of bills. Coming in the face of rising prices and the increased cost of doing business, this rate is being very favorably received and is sure to prove an important factor, promoting new growth and attracting new industries to Glendale.

REJUVENATING THE MOTHER LODE BY ELECTRICITY

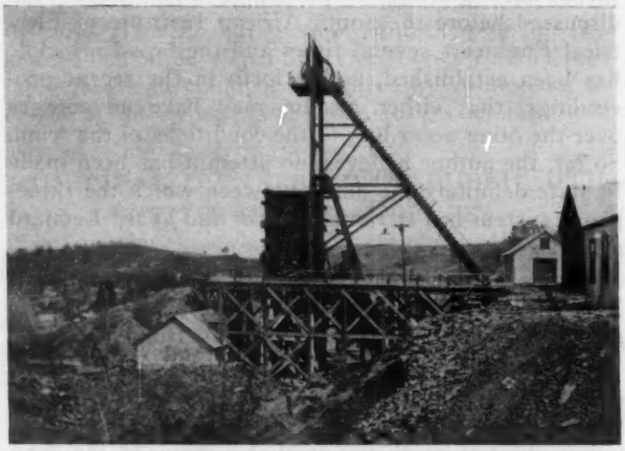
BY W. E. ESKEW

(The greater efficiency and adaptability of electric power has put many a dying industry on its feet. How the great mother lode of California has been saved from early exhaustion by the application of electricity is interestingly told in this article. The author is a district manager of the Pacific Gas & Electric Company.—The Editor.)

The application of electric power has been rapid and its use extended to all branches of the mining industry, until at the present day there is a connected load in Amador county of 10,035 horsepower in motors. Its first application was for driving mills where constant speed is absolutely essential for the successful operation of the concentrators. For this purpose it proved the ideal motive power and soon made a fast friend of the "mill boss" who had at first received it with, to say the least of it, skepticism. The motor-driven air compressor with the accompanying pneumatic drills was not long in supplanting the old method of hand drilling. The air compressor at the Old Eureka mine is a typical example of the type in general use by the mines of this district. This is an Ingersoll-Rand, Imperial type compressor with high and low pressure cylinders, and compresses to 100 pounds pressure per square inch. It is driven by a 160-h.p., 440-volt, 720-r.p.m Westinghouse Type C. S. motor and handles 1200 cubic feet of air per minute.

Another, and perhaps one of the most important uses to which electric energy has been applied, is in its adaptability to driving underground pumps. Prior to the advent of electricity, two methods were in vogue for handling the water. The first and simplest method was by hoisting or "baling" the water. When, however, from 100,000 to 150,000 gallons of water a day had to be hoisted, as was often the case in the rainy season, it left little time for anything else.

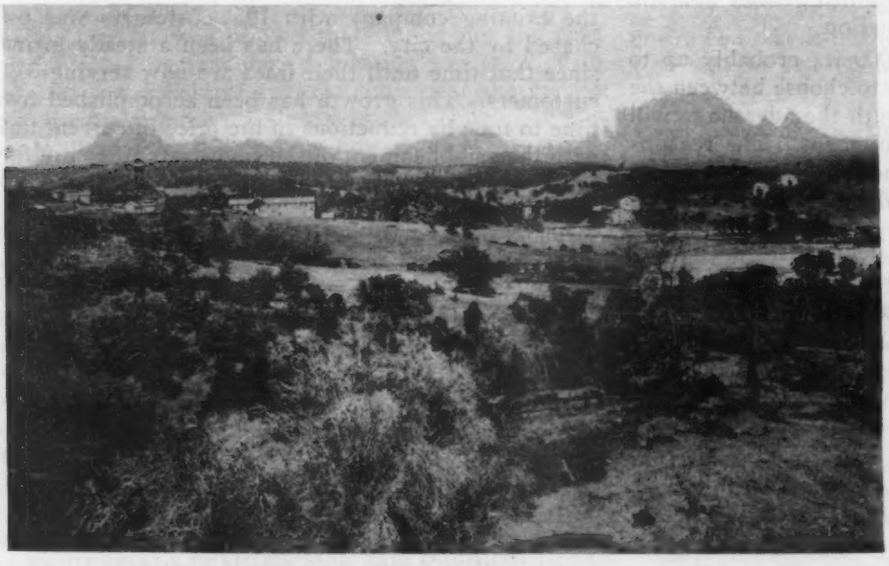
A notable example of an underground pumping installation at the present time is that at the Argonaut mine. Here a 3-cylinder plunger pump, driven by a 75-h.p., 2200-volt motor, is located at the 3900-foot level, or 3900 feet below the surface. This pump lifts the water 1900 feet to the 2000-foot level, where a similar pump, together with the necessary piping, is being installed to lift the water a distance of 2,000 feet to the surface. Another noteworthy installation is at the 2000-foot level in the South Eureka mine. Here a duplicate set of pumps and motors are installed, consisting of high pressure triplex pumps, each geared to a 150-h.p., 440-volt motor. The duplication is made to insure the mine against becoming flooded in case



The new electric hoist at the Old Eureka mine.

one of the motors should burn out or a pump become disabled for any considerable length of time. These pumps handle the water from both the South Eureka and the Central Eureka mines, which are connected at different levels underground. This 2000-foot level is at a vertical depth of approximately 1800 feet, representing a water pressure of nearly 800 pounds to the square inch, or considerable more than that of any of our high-head water-power plants.

The mine operators were somewhat slower to adopt the electric hoist, as in the earlier days of the industry interruptions of service were not infrequent, and it was not pleasant to have the power go off with a large body of men underground and no way of bringing them to the surface. However, with the rapid improvements in the electrical industry, interruptions became less and less frequent and that feeling has now entirely



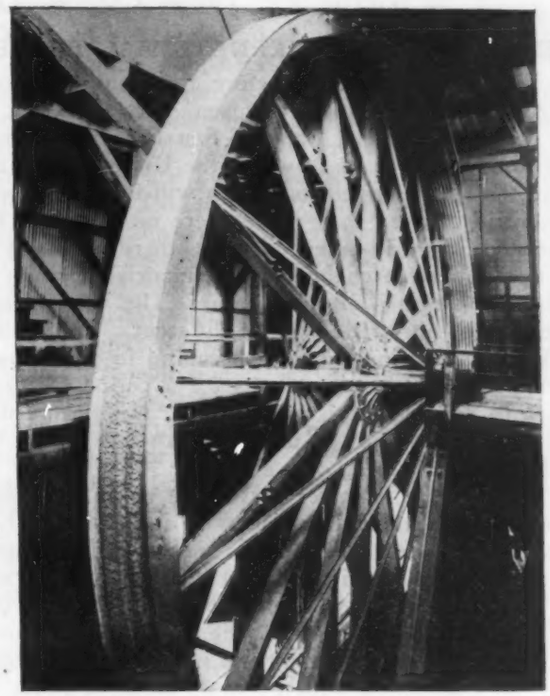
General view of the Kennedy mine on the Mother Lode near Jackson, Amador County. Note the 100-stamp mill (on the left) and the four wheel houses (right)

died away. The first electric hoist was installed at the Bunker Hill mine in 1907 and consisted of a 150-h.p., 550-volt, 450-r.p.m. G. E. motor, geared to the pinion shaft of the hoist. As the mine went deeper and increased the milling capacity, this hoist later proved inadequate and in 1911 was replaced by a 300-h.p. Westinghouse motor of the same speed. This motor, instead of being geared, was equipped with a rope transmission, thereby eliminating much of the noise of the geared drive and somewhat lessening the strain on the motor, due to a certain amount of flexibility between the motor and hoist.

The next installation of an electric hoist was at the South Eureka mine in 1910, where a 200-h.p. motor was installed in place of the former steam hoist. This motor, however, proved too small to handle the work and in the same year was replaced with a 400-h.p. General Electric motor. The duty imposed upon even this motor was too severe, it developing at starting as much as 1300 horsepower. After a couple of years, an exactly similar motor was mounted on the opposite side of the sheave and these two are operated as one motor from the same controller, giving a rated capacity of 800 horsepower.

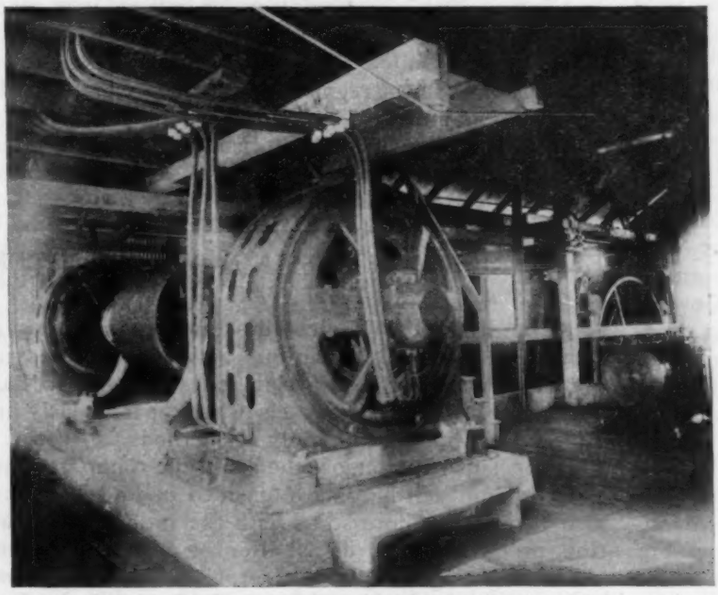
Perhaps the most interesting installation of all is that at the Argonaut mine, where a 225-h.p., 2200-volt Westinghouse motor is installed on the 3900-foot level, or nearly 2000 feet below sea level. All of the ore is now being extracted from below the 3900-foot level. It is first hoisted to this level, where it is dumped into an ore bin, from which it is again loaded into skips and hoisted to the surface by means of the first-described hoist. Here again it is loaded into cars or skips and then hoisted up the tramway to the mill located on the hill above.

The Kennedy Mining and Milling Company adopted the expedient of elevating tailings after they leave the mill. The tailings are conducted from the mill to the first wheel, and from each wheel to the next by means of flumes built on about a 2½ per cent grade, as on a less grade than this the sand will not flow. The wheels are built on what we might call the "inverted principle" of an overshot water wheel, the pulp filling the buckets at the bottom, and as the wheel revolves it is discharged near the top. Each wheel is fifty-six feet in diameter and lifts the pulp



Wheel used for elevating tailings from the Kennedy Mill

forty feet, being driven by a 15-h.p. motor. The buckets are at the outer periphery of the wheel, the circular part shown being merely the pulley carrying the belt from the motor. These wheels make three revolutions per minute.



Electric hoist at the South Eureka mine showing the two 400 h.p. motors on the same shaft

The ore bodies of the Mother Lode are all relatively low grade, and as they are worked to greater and greater depths the cost of extracting the ore is increased proportionately. Added to this is the extra burden of having to expend large sums for impounding their tailings, and the increased cost of all supplies, chief among which are lumber, steel and powder. The copper, zinc and other metal mines can well stand the increased cost of mining because of the high market value of their product, but the value of an ounce of gold has shrunk until its purchasing power is the lowest it has ever been in the world's history.

It is, therefore, only by the application of the most modern methods and appliances that these mines are able to be worked at a profit, and I do not think it too much to claim that, were it not for the wide application of electricity and its adaptability to such a diversity of uses, few of the mines of the Mother Lode would be in operation today.

THE OPEN DOOR OF THE PACIFIC

(Other electrical manufacturers and dealers are doing a profitable export business — why not you? The American people have heretofore been backward about going outside their boundaries, but the time is at hand when the opportunity is not only waiting but asking for you to meet it. And it is in the lands which border the Pacific that most of these opportunities are to be found. Here is a list which almost completes the circle of Pacific shores.—The Editor.)

ENCOURAGING INTERNATIONAL TRADE

In a recent address before the Southern Commercial Congress, John Clausen, Vice-President of the Crocker National Bank of San Francisco, points out some of the ways in which the United States can meet the keen competition which will follow the war. He made it clear that while there is doubtless too much optimism in some quarters, there is bound to be a considerable change in the financial position of the United States after the war. The volume and direction of our trade will be different. The ability of European nations to furnish capital to other countries will be lessened, perhaps for a period of many years to come. South and Central America, China and Mexico may turn to us more than ever before for their financial needs.

Our people however have not been generally accustomed to make investments at a distance. They must be educated along these lines and encouraged by organizations similar to that of the British Trade Corporation recently formed. The fundamental object of this organization is the giving of financial assistance to British traders and manufacturers, especially in connection with overseas trade, without in any way acting as a competing contractor, merchant or trader. The recently passed Federal Reserve Act with its facilities for Branch Banking in foreign countries offers an opportunity for such a development. The legislation now before the Senate admitting of combinations in export trade will further help the situation.

Manufacturers are beginning to realize that their most aggressive competitors are not their fellow-countrymen engaged in international trade, but rather the powerful combinations of merchants in other countries.

INCREASED USE OF ELECTRICITY IN NEW ZEALAND

The British Trade Commissioner in New Zealand writes that, owing to a recent labor dispute at Wellington, the gas supply for all purposes has been restricted, and this has led to a large increase of orders for the installation of electric lighting, heating, cooking, etc., appliances. Householders and business people turned to electricity as a substitute or stand-by for their various requirements, and electrical engineers and suppliers of electrical goods experienced a rush of business. According to the local press, the sale of electric cookers, heaters, kettles, smoothing irons, etc. constituted a record and, further supplies of such articles being difficult to obtain, stocks are now low. For some time past the only market open to New Zealand buyers for the purchase of electrical goods has been the United States, but now even that source is becoming uncertain.

ELECTRICAL TRADE WITH HONGKONG

The declared exports from Hongkong to the United States for the first half of 1917 amounted to substantially twice the exports from the colony to the United States in the whole of any previous normal year. This record arises partly from higher values but mostly from increased volume of trade. It is in keeping with that steady gain in the trade with the United States which has characterized the trade of

One of the great freight carriers of the Pacific—the steamship China

Hongkong for the past eight years and which has been accentuated and accelerated during the war in Europe. Aside from trade with America the business of the port has changed little from the volume of the last half of 1916. In many lines of imports it is practically impossible to secure deliveries because of conditions in the United States and Europe, this being partcularly true as regards steel and metal goods generally and most kinds of machinery, especially electrical machinery and materials. From the United States, however, imports in most of these lines have continued far above normal.

ELECTRICITY IN RUSSIA NOW AND AFTER THE WAR

The Electrical Review of London publishes a survey of electrical conditions and opportunities in Russia prepared by a Russian investigator who has been analyzing conditions elsewhere, particularly in America, with a view of applying methods to Russia:

The supersession of the kerosene lamp by the electric lamp will become intensified in Russia in the near future, the more so as with the rational installation, production, and distribution of electrical power, electric lighting, at least in the towns, can easily compete with gas, and even with kerosene lighting. Gas and kerosene have their particular spheres of application where electricity, at least in the near future,

cannot compete. With the chronic scarcity of coal in Russia, and the urgent necessity of it for the metallurgical industry, the burning of coal for lighting purposes appears to be, from the point of view of economy, altogether inadmissible, as electrical power can be successfully obtained by the use of cheap fuel—such as brown coal, peat, and the many water courses.

The expenditure of electrical energy in the eight years, 1905-1913, for lighting purposes only, increased by 73 per cent, whilst the expenditure for motors and other industrial purposes rose 473 per cent. In other words, the application of electricity for motors and general industrial purposes increased during that time 6½ times quicker than for lighting purposes. But if we take Poland into account, the expenditure of electric energy in 1913 for the whole Empire amounted to about 2,000 million kw.-hours, of which only 20½ per cent was used for lighting and 79½ per cent for motors, whilst in 1905 the deliveries for lighting made 46 per cent and for motors 54 per cent only.

American industry, as is known, is distinguished by the highest productivity in the whole world, and that is explained, to a large extent, by the fact that, being always short of hands, the Americans were obliged more than in other countries to adopt the principle of attaining the largest possible result with the smallest expenditure possible of labor. Russia belongs to the list of countries that enjoy such advantages, and therefore the rational development of the production of electrical power is one of the first problems to be dealt with immediately after the war.

If we turn to the present condition of the Russian electrical industry, we shall see that with very few exceptions—for example, the Moscow station—the Russian electrical stations are equipped irrationally in technical respects and, above all, with old machines. As the still young electrical industry is in a stage of rapid development, it has of recent years made such colossal progress that the machines installed in the Russian stations 10 or 15 years ago, perhaps at the time the very last word in technical equipment, are at this moment quite unsuitable for electric current production.

JAPAN'S ELECTRICAL INDUSTRIES

The Department of Communications has published the following statement of the condition of the electrical industry in Japan at the end of July, 1917: Plants supplying current, 568 companies with $160,796,063 capital; electric railways, 42 companies, $21,706,985 capital; engaged in both branches, 48 companies, $148,482,339 capital. Compared with the figures for the corresponding period last year there is an increase in the number of enterprises of 35, with an aggregate capital of $17,892,057.

ELECTRICAL ACTIVITY IN VENEZUELA

The machinery for the electric light plant at San Carlos, capital of the State of Cojedes, is expected to arrive shortly. It is hoped that the plant will be in operation by October 28. Sr. P. J. Diaz Otero recently visited Duaca, State of Lara, in the interests of a project for supplying that municipality with electricity. The municipal council is studying the project.

LOW POWER RATES IN CANADA

The Hydroelectric Commission of Ontario is a government commission charged with developing and purchasing water power where available in the province and selling electrical energy at cost to municipalities, the price being adjusted from year to year. About 702,000 h.p. of the estimated 5,000,000 h.p. in Ontario has been developed. The consumption of coal for power is said to have been reduced to the extent of 4,500,000 tons, a saving of about $20,000,000.

The commission, heretofore has concentrated its efforts on the western part of the province, the demand for power being more urgent there. Now, however, more attention is to be given to the east. An agreement has just been entered into with the Cedar Rapids Power Company (a concern auxiliary to the Aluminum Company of America) to furnish 10,000 h.p. of electrical energy of 110,000 volts at a point near Cornwall, which power would be available for the towns in this district.

The Cedar Rapids Power Company, constructed a 45 mile transmission cable, carrying 100,000 h.p. of electrical energy, from Cedar Rapids in the St. Lawrence River, 30 miles east of Cornwall, through Cornwall to Massena, N. Y. (See Daily Consular and Trade Reports for July 12, 1913, and Sept. 22, 1914.) This power, although going through Cornwall, has not been available for local industries because of the lack of a stepping-down station. The Hydroelectric Commission plans to erect such a station.

The price to be paid the Cedar Rapids Company by the commission will be between $11 and $15 per h.p. The cost of stepping down from the 110,000 volts to a voltage suitable for Cornwall's purposes, say to 26,000 volts, would make the price about $24, the price being reduced in proportion as the amount of horsepower used is increased.

OPPORTUNITY FOR AMERICAN TELEPHONE SYSTEM IN MEXICO

The telephone equipments in use in the cities of Progreso and Merida, Yucatan, Mex., are of an antiquated Norwegian make and the service is unsatisfactory according to newspaper reports.

Public sentiment is said to be strong in its demand for a better service and two of the leading industrial and commercial organizations are installing temporary independent telephonic connections between their Progreso and Merida offices.

The time is opportune for American manufacturers of telephones to get in touch with the proper interests in Yucatan, some of whom, it is stated, have expressed their desire to receive correspondence and literature on this subject.

OPPORTUNITIES IN URUGUAY

A manufacturer of woolen goods in Uruguay desires to be supplied with the latest catalogues of American firms making machinery of all kinds used in the woolen industry, motor and electrical equipment, and motor trucks. All literature should be sent post prepaid in the open mail, as there are many delays incident to mail deliveries by parcel post. The accompanying correspondence should be in Spanish.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(Over and above the return which the money invested would bring on the money market, the owner of a public utility is entitled to a "profit" as a reward for having established the business and for the risk in conducting it. He should be permitted to share in the prosperity he has helped create. With due regard to permissible rewards for good management, the rates can therefore best be fixed by establishing a definite ratio to the volume of business involved.—The Editor.)

PUBLIC UTILITY RATES AND THE VOLUME OF BUSINESS

In presenting the following ideas relating to the profit which the public utility should earn, the writer disclaims any intent to appear as an advocate of limiting the profit which the owner of the public utility can make at reasonable charges for the service rendered or the commodity furnished. When the owner succeeds by efficient management in keeping operating expenses low he is entitled to a suitable reward. His treatment by those who are charged with regulating rates should be such that efficient management will be encouraged and not discouraged. The suggestions which follow should be considered in the light of these qualifying statements.

The compensation to which the owners of public utilities are entitled for management and business hazards, or, speaking broadly, the profit to which they are entitled, can not be brought into any definite, universally applicable relation to the capital invested in such enterprises. Another element, the volume of business, deserves consideration in this connection.

That there should, in the case of every legitimate public utility, be some profit will be admitted. This profit will appear as an excess of earnings, present and prospective, over a fair allowance for the use of the money invested in the utility, provision having first been made for operating expenses and replacement requirements. It has been customary heretofore to use value as the starting point when rates are to be fixed with inclusion of some allowance for 'going value.' The general practice also prevails of introducing into the calculation a rate of return on the so-called "fair value" of the property, higher than ordinary interest rates. Without giving special consideration to the question of compensating the owner for management and of allowing him to share in the general prosperity of the community, which prosperity he has helped to create, a way has thus been found to permit the utility to yield some profit. Under such procedure there will be cases, however, in which the profit will be very large and may be an onerous burden upon the rate-payer, as in the case of certain utilities in which the amount of invested capital is large when compared with their annual gross income and particularly if the ultimate profit is swelled by the increasing value of large holdings of real estate. And there will be other cases in which the profit may be small and inadequate under reverse circumstances, when the volume of business is large in comparison with the invested capital. As an example of the first kind, certain water supply enterprises on the Pacific Coast might be cited. These not only require the investment of relatively large amounts of capital but in connection with some of them large areas of land are held for reservoir and related purposes. As an example of the second kind, certain express companies may be noted which operate under contract with other transportation companies and which do a large business on a small investment of capital.

The proposition has, therefore, been submitted as noted in a preceding article of this series, that the equitable arrangement would be to bring the profit, covering compensation for management, for hazard, and for participation in general prosperity, into some definite relation to the volume of business, that is, into some fixed relation to the amount of annual gross income.

When the procedure is followed of applying the interest return to a rate-basis determined from the amount of capital legitimately invested, including cost of developing the business, cost of franchises, water-rights and the like, but without deduction of accrued depreciation, a reasonable profit allowance should not be difficult to determine. If the interest allowance on the rate-base be supposed to cover the full cost of borrowed money, due regard being had to the effect of legitimate discounts and commissions, then certain additions to earnings, perhaps about as below set forth, would be fair and proper, this being in lieu of interest on the additions to capital, which is has been customary to make for going value, or other intangible elements. In the last analysis the intangible values result from the capitalization of profit. It will, therefore, be found simpler and more satisfactory to reverse the usual procedure by determining what the profit should be, instead of starting with a set of intangible values which after all result from the capitalization of an ill-defined arbitrary subdivision of this profit. The following profit allowances are tentatively suggested and remain subject to modification upon further study:—

When	gross	income	is	$ 10,000	about	15%	$ 1,500	per	yr.
"	"	"	"	100,000	"	14.5%	14,500	"	"
"	"	"	"	500,000	"	13.5%	67,500	"	"
"	"	"	"	1,000,000	"	12.5%	125,000	"	"
"	"	"	"	3,000,000	"	10%	300,000	"	"
"	"	"	"	5,000,000	"	9%	450,000	"	"
"	"	"	"	10,000,000	"	8%	800,000	"	"
"	"	"	"	20,000,000	"	7%	1,400,000	"	"
"	"	"	"	40,000,000	"	6%	2,400,000	"	"
"	"	"	"	100,000,000	"	5%	5,000,000	"	"

The allowances, here suggested as additions to the interest return on the rate-base, are those which appear reasonable under ordinary conditions. They should be considered subject to modification to fit any particular case and they will not be adequate when it happens that the cost of the output has been materially reduced by the introduction of a new invention which may be the result of efficient management and skillful operation, and the use of which may entitle the owner of the utility to larger profit for a time at least than he would expect under ordinary circumstances.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(Men of the industry, interested in the development of electric power from our streams as well as those looking forward to the increasing application of electric pumps to irrigating problems, should be familiar with the elements of western water law. The growing tendency of courts of last resort to recognize the wide scope for the proper exercise of "police power" is most gratifying to those who are striving to prevent the waste of our natural water resources. The author of this valuable series of articles is a well known member of the California Water Commission and writer on Western Water Law.—The Editor.)

JURISDICTION OF PUBLIC UTILITY COMMISSION

Gates v. Public Service Commission of Oregon, 167 Pac. 791

In 1902 the council of Dallas, Oregon, passed an ordinance providing for a public water supply, contracting with one Gates to construct a water plant for the city, and providing for the payment of $12,000 and the lease of said plant to Gates for a period of twenty years. Under the terms of the ordinance, the city secured the land for reservoirs and necessary rights of way, and likewise the rights for the use of the waters of Canyon Creek, the source of supply. The ordinance also fixed the rates to be charged by Gates and to be paid by consumers of water within the city.

The system was completed by Gates and accepted by the city in 1904, and $12,000 was paid to Gates as provided in the ordinance. In 1909 an agreement was made between the city and Gates reducing the rates. In 1913 the city petitioned the Railroad Commission of Oregon, claiming that the rates charged were unjust, unreasonable and excessive. Gates, in answering, challenged the jurisdiction of the Commission.

Although the Oregon public utility act includes all corporations or individuals owning, operating or managing plants for furnishing water, it also provides that no plant owned or operated by a municipality shall be deemed a public utility. In the Gates case, the Supreme Court of Oregon held that the City of Dallas is the owner of the water plant in question, and that the Commission had therefore no power to change the rates. As the ordinance and other contracts between Gates and the city are peculiar in their terms, the opinion in this case cannot be considered as holding that the court will not allow other contracts to be set aside and the rates to be fixed by the Railroad Commission.

POLICE POWER IN PREVENTING WASTE FROM ARTESIAN WELLS

Eccles v. Ditto, 167 Pac. 726.

A number of Western states have passed statutes governing the prevention of waste from artesian wells. In 1907, in the case of Ex parte Elam, 6 Cal. App. 233, the California District Court of Appeal upheld a California statute approved March 6th, 1907, providing for the prevention of waste from artesian wells and prescribing penalties therefor. As the doctrine of correlative rights regarding the use of percolating waters is recognized in California, it was expected that the court would so hold. In other western states however, with the exception of Washington, the common law rule of percolating waters is recognized—which is that the owner of the surface is the owner of all percolating waters beneath the surface. The Eccles case is therefore most interesting, as it is a decision by the Supreme Court of New Mexico upholding the validity of a statute of New Mexico which not only declares waste from artesian wells to be a nuisance, but authorizes the Artesian Well Supervisor of each county to repair wells, the waters of which are running to waste, and to bring suit, if necessary, to collect the expenses of such repairs, which expenses become a lien upon the land. The opinion does not discuss the question of the ownership of percolating waters, but finds its basis in the cases upholding the exercise of police power to abate nuisances.

As shown in the opinion, there are many cases in the eastern states upholding the validity of statutes designed to prevent the waste of oil and gas.

In commenting upon the New Mexico statute, the court said (p. 728):

"There are two justifying reasons for the enactment of the statute under consideration by the Legislature of this state, the first being the necessity of using water for irrigation and the limited quantity of water available. The artesian waters in a given district come from the same source, and are obtained by sinking wells to the common basin, thereby enabling the water to find its way to the surface. Necessarily, the waste of water derived from the common source of supply diminishes the amount of water available for legitimate uses, and hence works an injury and a detriment to the general public desiring to make use of such waters. The second reason is that permitting the water to run to waste in large quantities results in the "water logging" of lands, and destroys its productiveness. In the artesian belt in the Pecos Valley, it has been found necessary to construct drains at enormous expense to carry away the waters which find their way to the lower lands. Hence we find ample justification for the legislative act regulating the construction and use of such wells, thereby preventing the unnecessary waste of water."

APPROPRIATION OF WATER APART FROM LAND

Lake Shore Duck Club v. Lake View Duck Club, 166 Pac. 309

In passing upon a dispute between two hunting clubs over the right to divert the waters of certain streams for irrigating lands and forming duck ponds, the Supreme Court of Utah was called upon to pass on the right to appropriate waters for use upon the public domain. In writing its decision the court called attention to many cases in which it was held that one might appropriate water for use upon the public domain, but in all of such cases it appeared that the appropriator had "some sort of possessory right, good as against everybody but the government." In the Duck Club case however, the lands involved were part of the public domain, "unsurveyed, unenclosed, unoccupied and untilled." Although the court did not question the fact that the waters diverted were being applied to beneficial use, it concluded that "for the

purpose of effecting a valid appropriation of water under the statutes of this state we are decidedly of the opinion that the beneficial use contemplated in making the appropriation must be one that inures to the exclusive benefit of the appropriator and subject to his complete dominion and control."

It held therefore that plaintiff's attempted appropriation is invalid.

RIGHTS OF RIPARIAN OWNER FOR SUPPLYING WATER TO RAILROAD ENGINES

Atchison, T. & S. F. Ry. Co. v. Shriver, 166 Pac. 519

In these columns, in referring to cases dealing with riparian rights, it has been stated that riparian owners are each entitled to a reasonable use of the waters of the stream upon their lands riparian thereto. In the Shriver case, under note, the Supreme Court of Kansas held that the "abstraction of water for railroad purposes by a railroad company which is a riparian owner is merely another use, the propriety of which cannot be questioned so long as the rule of fairness and equality between owner and owner is observed." The only reason for considering the case noteworthy is that, although riparian owners are entitled to a reasonable use for irrigation and other purposes, such reasonable use is restricted to use upon the land. Strictly speaking, water placed in the boilers of ordinary railroad locomotives is used elsewhere than upon the riparian land.

The Court's view that such use is a reasonable use and is consistent with the equal rights of other riparian owners should be generally accepted.

CHANGE OF POINT OF DIVERSION

Moyle v. Salt Lake City, 167 Pac. 660

In developing a water supply in the later eighties, Salt Lake City entered into an agreement with a number of farmers having rights to the use of water of Parley's Canyon Creek, under which agreement the city was to take the water of the creek and give in exchange water from its system from Utah Lake and Jordan River. Moyle, one of the parties to the agreement, owned the equivalent of 144.79 "acre shares" of the waters of Parley's Canyon Creek. As the lands upon which she was using the water became part of Salt Lake City and, therefore, were no longer used for farming purposes, she desired to change the use of water to lands owned elsewhere by her, adjacent to the city system. As the city refused to allow such exchange, litigation resulted. The Supreme Court of Utah held that as the agreement was silent as to the place of diversion from the city's system, there was no reason why the rule so long applied to change in point of diversion from natural streams should not apply. This rule, as is well recognized wherever the doctrine of appropriation applies, is that the point of diversion may be changed without loss in priority or extent of right, provided no others are injured thereby.

As the court held that the rights of the city would be in no wise affected by the desired change, it was so ordered.

THE EFFECT OF WATER POWER DEVELOPMENT ON TRANSPORTATION

BY JOHN E. SMALL

(In the editorial pages of this issue, the matter of the water development bills is considered at some length. This extract from the speech of the Congressman from North Carolina before the Southern Commercial Congress sheds new light on the possibilities latent in our undeveloped water powers.—The Editor.)

The utilization of the enormous amount of energy latent but now wasting in our falling waters is intimately connected with the solution of such great national problems as extension of inland waterways; the national defense; shortage of food; conservation of coal, oil, and labor; irrigation of arid lands, and railroad car shortage. In addition to conserving vast quantities of coal and the labor to mine and handle it, the hydro-electric energy existing in our running waters would, if developed, be utilized in the manufacture of explosives, fertilizers, wood-pulp and paper, electrochemicals, copper and aluminum, and in the operation of railroads by electricity; operation of irrigation pumping plants; operation of farm machinery; and in numberless other industrial applications.

Instead, however, of utilizing the energy contained in the force of our descending waters, we are up to now obtaining the energy mainly from steam through use of coal, which can never be replaced, and which requires hundreds of thousands of men for mining when labor is so scarce, and cars for transportation when they are so badly needed for carrying merchandise and raw materials.

A careful estimate shows that were the water powers developed which are now wasting in the rivers of the United States and were locks installed in the power dams, over 4000 miles of the upper reaches of these streams would be opened to navigation. The cost of these river improvements would be upwards of eight hundred million dollars, and, if accomplished by private capital for purpose of power production, would not cost the Government a dollar except for the locks and removal of minor obstacles in those portions of the stream not connected with power development. This would mean the extension of navigation for an aggregate of 4000 miles in 35 rivers, traversing 20 states in such widely different sections of the country.

With the United States at war, and its every energy being exerted to increase production of farm, factory and mine, with great bodies of troops and supplies moving, and with our ships in foreign service, as well as those engaged in coastwise and lake trade, commandeered by the Government to act as carriers for troops, mar material and supplies, there will be an ever increasing volume of commerce. How is it to be transported? How are the railroads to handle it?

Germany has thousands of miles of canals and rivers which have been made navigable, and are being used for carrying heavy freight, leaving the railroads free to be used for the rapid transportation of troops and food supplies. It is said that were it not for her freight-carrying inland waterways the war would be over and Germany beaten because the rapid movement of her troops from one front to another would have been seriously impeded had the railroads been occupied with heavy freight shipments.

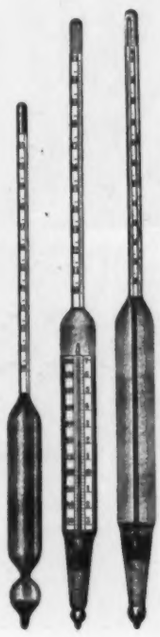
FUEL OIL AND STEAM ENGINEERING

(How the Baume scale is used in fuel oil practice and what it means is treated in this discussion. The confusion that has existed hitherto in the relationship of the Baume scale reading and the specific gravity of oil is cleared up. The discussion concludes with a detailed illustration of how the gravity of fuel oil is most accurately determined by means of the Westphal Balance. Following this treatment is a brief on the types of boilers used, when oil fired, that should prove helpful along lines previously treated in this department.—The Editor.)

THE GRAVITY OF OILS IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY

Fuel oil is classified, marketed, and designated by its gravity. Gravity is denoted in two distinct ways. The scientific method of notation is known as the "specific gravity," which is the ratio of the weight of a given volume of the oil to that of an equal volume of pure water. There has, however, grown up in practice an empirical method of representing the gravity of oil by what is known as the Baume scale. This scale has two separate and distinct formulas for its conversion to specific gravity readings. One formula is for liquids heavier than water and the other for liquids lighter than water. In each instance the scale is graduated to 100 degrees and overlaps 10 degrees.



BAUME HYDROMETERS

Antoine Baume, a French chemist of the eighteenth century, distinguished for his success in the practical application of the science, was the inventor of the so-called Baume scale now universally adopted in fuel oil practice for denoting the gravity of crude petroleum.

The Scale for Liquids Heavier Than Water.—Baume hit upon a unique plan for the establishment of his scale. Certain fixed points were first determined upon the stem of the instrument. The first of these was found by immersing the hydrometer in pure water, and marking the stem at the level of the surface. This formed the zero of the scale. Fifteen standard solutions of pure common salt in water were then prepared, containing respectively 1, 2, 3 .....15 per cent (by weight) of dry salt. The hydrometer was plunged in these in order and the stem having been marked at the several surfaces, the degrees so obtained were numbered 1, 2, 3.....15.

The instrument thus adapted to the determination of densities exceeding that of water was called the hydrometer for salts.

Expressed mathematically in its relatonship with the specific gravity S, the Baume degree reading B becomes for liquids heavier than water:

$$S = \frac{145}{145 - B} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

The Scale for Liquids Lighter Than Water.—Since practically all grades of crude petroleum are lighter than water, we are more interested in the method of expression for this latter phase of gravity denotation.

The original Baume hydrometer intended for densities less than that of water, or the hydrometer for spirits, as it was called, was constructed on a similar principle to that for the hydrometer of salts above described. The instrument was so arranged that it floated in pure water with most of the stem above the surface. A solution containing 10 per cent of pure salt was used to indicate the zero of the scale, and the point at which the instrument floated when immersed in distilled water at 10° R or 54½° F. was numbered 10. Equal divisions were then marked off upwards along the stem as far as the 50th degree.

The Confusion in Expression for Specific Gravity and Baume Readings.—Modern gravities are expressed for liquid temperatures of 60°F. instead of 54½°F. as above set forth. This fact together with other inconsistencies and errors in observation have led to the invention of some seventeen different mathematical expressions, by various investigators and scientific bodies, to properly set forth a relationship between specific gravity and Baume readings for liquids lighter than water. The contest has simmered down to two equations in American practice.

The formula that is used by Tagliabue in his tables, and that has been adopted by the Petroleum Association, which embraces within its membership practically all of the oil refiners of the United States, is as follows:

$$S = \frac{141.5}{131.5 + B} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

On the other hand, in Kent's Mechanical Engineer's Handbook is found a formula which has been adopted by the United States Bureau of Standards and which receives the strong endorsement of the mechanical and electrical engineers of the Pacific Coast. This formula is

$$S = \frac{140}{130 + B} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

The Limitations of the Hydrometer.—The hydrometer method of ascertaining the gravity of crude petroleum is at best only approximate as one may readily surmise. In order then to ascertain the gravity of oil with scientific accuracy, a more refined method

is necessary. This is usually accomplished by determining the specific gravity of the oil with whatever moisture content it may contain by means of an actual water equivalent comparison, and then converting this into degrees Baume. This roundabout method once again emphasizes the uselessness of employing the Baume scale. If the moisture content of the oil has been ascertained, a computation is then made in order to arrive at the actual specific gravity or Baume reading for the moisture free oil.

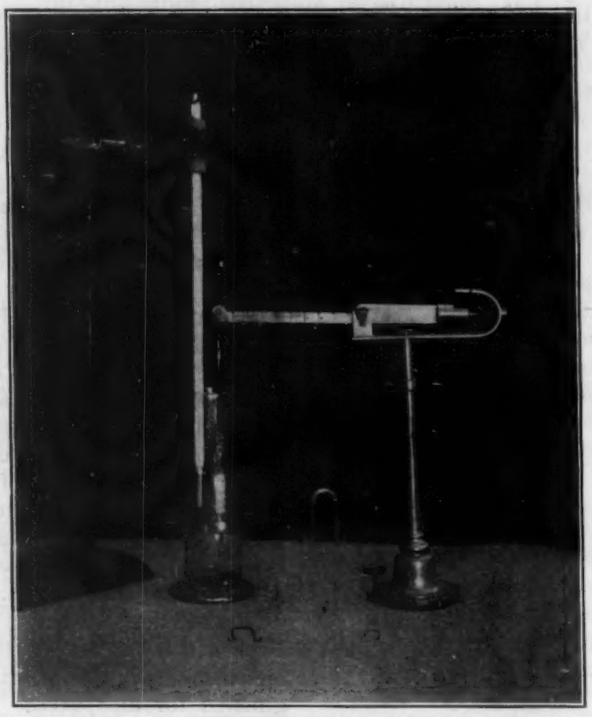
The Method of the Westphal Balance for Exact Measurement.—Let us then examine in detail such a method. The Westphal balance is a convenient and accurate method by which the specific gravity of fuel oil may be obtained to four decimal points. As shown in the illustration, the apparatus necessary consists of a balance arm, supported on knife edges, from one end of which is hung a glass bulb, the other end being counter-weighed. Along the balance arm are nine notches, the hook supporting the glass bulb being in the position of the tenth notch. The glass bulb has a displacement of exactly five grams of pure water at 4°C., which is the point of maximum density of water, the density for which scientific gravity comparisons are made. Hence if the bulb above described were so immersed in water at 4°C. a five gram weight would establish equilibrium if hung from the hook. This would indicate a specific gravity of 1.0000.

The zero point of the balance is adjusted by turning a thumb screw, which forms one point of the three point support shown in the figure, until the pointers are opposite each other before the bulb is immersed. For specific gravities less than 1.0000 the five gram rider called the unit weight is hung in a notch such that equilibrium isM nearly reached, never exceeded. This gives the first decimal place. The 1/10, 1/100, and 1/1000 unit weights are then hung respectively in notches so that equilibrium is finally established. The specific gravity is then read directly to four decimal places by noting the notches in which the riders hang, commencing with the large strider. Thus when the unit weight hangs in the ninth notch, the 1/10th weight in the sixth notch, the 1/100 weight in the seventh notch, and the 1/1000 weight in the third notch, the specific gravity is evidently .9673.

Details of Procedure.—Before proceeding with a gravity determination, the oil sample should be allowed to stand in the laboratory several hours in order that any drops of water in the oil may settle. A small quantity is then poured from the sample can into a suitable glass jar. The Westphal balance, having been dusted with a soft brush, is then adjusted to equilibrium and the specific gravity of the sample obtained. The temperature is also ascertained by means of the thermometer inserted in the oil sample. Since specific gravities of fuel oil are by common practice referred to at a temperature of 60°F., it is now necessary to make a second determination at a temperature differing by 15° to 20°F. from the first, in order that we may have sufficient data with which to compute what the gravity would be at 60° temperature.

To take this second reading the temperature of the sample in the jar may be raised by immersion in a water bath. In doing this great care must be taken to allow no water to get into the oil.

Computations Involved.—Let us next illustrate the computations involved in a gravity determination. Let us assume that by means of the Westphal balance, the oil sample is seen to have a specific gravity (S_1) of .9644, at a temperature (t_1) of 68.9°F., and a specific gravity (S_2) of .9587 at a temperature (t_2) of 86.6° F. Since the specific gravity has changed ($S_1 - S_2$) over a temperature change of ($t_1 - t_2$) the change for 1°F. would be $\frac{(S_1 - S_2)}{(t_1 - t_2)}$. This change in specific gravity for 1°F. is the coefficient of expansion (C_e), for the oil and may be expressed by the formula



A COMMERCIAL BALANCE FOR DETERMINING SPECIFIC GRAVITY OF OIL

The common hydrometer is not of sufficient accuracy to determine the specific gravity of oil used in fuel oil tests. A simple and accurate method for such determination is accomplished by the employment of a Westphal Balance as shown in the illustration. The specific gravity is first ascertained by comparison of the oil with a water standard and then by means of the mathematical relationship connecting specific gravities and Baume readings, the latter gravity reading is ascertained.

$$C_e = \frac{(S_1 - S_2)}{(t_1 - t_2)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

In the particular case then we now find that

$$C_e = \frac{.9644 - .9587}{69.9 - 86.6} = -.000322.$$

The coefficient is thus seen in this case to represent an intermediate value, for in practice we find that in different oils C_e varies from (— .00027) to (— .00042).

From the fundamental definition of the coefficient of expansion it is now seen that at 60°F., the specific gravity becomes

$$S = S_1 + C_e\ (60 - t_1) \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

Consequently by making the proper substitutions for

the case cited we find that the numerical value of the specific gravity of this oil sample for 60°F. is

$$S = .9644 + [-.000322 \times (-8.9)] = 0.9673$$

In order to convert this specific gravity to the Baume scale we now, by substituting in formula given above for such conversion, find that

$$B = \frac{141.5}{S} - 131.5 = 14.78°$$

Assuming that this particular oil sample has been found to contain 0.5 per cent by weight of moisture and 0.484 per cent by volume, let us now see how we should find the specific gravity of the dry oil. Let V_w represent the percentage of water by volume and S_w, S_o, S_m represent respectively the specific gravity of the water, dry oil, and moisture. Then we may write the following relationship:

$$S_m = S_o \left(\frac{100 - V_w}{100}\right) + S_w \left(\frac{V_w}{100}\right) \quad \ldots\ldots\ldots (6)$$

From scientific tables we find that S_w at 60° F. has a value of .9990, and from the Westphal balance S_m has been found to be .9673. By transforming the formula above it is seen that

$$S_o = \frac{S_m - S_w \left(\frac{V_w}{100}\right) 100}{100 - V_w} \quad \ldots\ldots\ldots\ldots\ldots (7)$$

Consequently S_o may now be computed numerically.

$$S_o = \frac{.9673 - .00484 \times .9999}{1.00 - .00484} = .9671$$

If it is desirable to ascertain the Baume reading for the dry oil, we next ascertain its value from the above relationship of specific gravity and the Baume scale from equation ((2).

$$B = \frac{141.5}{S} - 131.5 = \frac{141.5}{.9671} = 14.8°$$

According to formula (3) this Baume reading would of course be computed as follows:

$$B = \frac{140}{S} - 130 = \frac{140}{.9671} - 130 = 14.8°$$

When a large quantity of oil is to be purchased and it is desirable to carry the Baume reading to still further decimal points, the two formulas will not of course check; hence, one or the other of these formulas should be agreed upon prior to a purchase of any magnitude.

TYPES OF BOILERS USED, WHERE OIL FIRED

One of the oldest forms of steam boilers and one that is still used extensively is the return tubular boiler. This is a fire tube boiler consisting of a shell or drum supported by brick walls which enclose the furnace. Inside the drum tubes are provided, running from end to end of the drum. The fire burns under the front end of the drum and the gases of combustion pass to the rear of the drum and then forward through the tubes, emerging from the front of the boiler to the smokestack. This boiler is suitable for oil firing, the oil burner being placed in the front and shooting the flame back toward the rear. Return tubular boilers are built in sizes up to 150 h.p. and are probably the most popular type of boiler for small sizes below 100 h.p. for stationary work.

Water tube boilers are used exclusively in large power plant work and are built in standard sizes up to 750 or 1000 h.p. and special boilers have been built as large as 2000 h.p. The many different makes of water tube boilers can be divided into three general types which may be designated as the B & W type, the Stirling and the Heine type.

The Babcock & Wilcox boiler is a sectional water tube boiler in which the tubes are expanded into vertical sectional headers. All of the tubes in any one vertical line are connected to one pair of headers but the different headers are not connected together except at the points where they tie into the steam drums and the mud drum. The steam drum may be either longitudinal or cross drum, the former having its axis running from the front to the rear of the boiler and the latter across the boiler. The headers are constructed of cast iron for low pressure boilers and of wrought steel for high pressure boilers, the latter construction making a boiler entirely of wrought steel. Owing to the fact that the headers are independent of one another this makes a very flexible construction, so that the boiler will stand sudden changes of temperature without causing trouble. The boiler is provided with vertical baffles so that the gases of combustion are led up across the tubes and then down and finally up again.

There are two general methods by which B & W boilers can be fired with oil, known as the front shot and the back shot. With the front shot arrangement the burner is introduced through the front wall and the flame is shot back towards the bridge wall. With the back shot arrangement the burner is placed at the bridge wall and the flame shoots forward. Owing to the fact that the tubes are inclined downwards toward the rear, the back shot arrangement gives a larger furnace volume at the end of the furnace farthest from the burner. This is of considerable advantage in permitting the gases to expand and cause perfect combustion. Another advantage of the back shot burner with this type of boiler is that the flame is shot forward and comes in contact with the front end of the tubes, whereas with the front shot burner the gases are forced back close to the front baffle and do not have any tendency to fill the front pass of the boiler. This condition is illustrated in the adjoining cuts. The result is that with the front shot burner a considerable portion of the heating surface is by-passed by the gases and is therefore, non-effective.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

NEW LAMP USES

The 500 Watt Lamp in Use

ALERTNESS is an attribute of the successful contractor-dealer that is being developed to a high degree in the West.

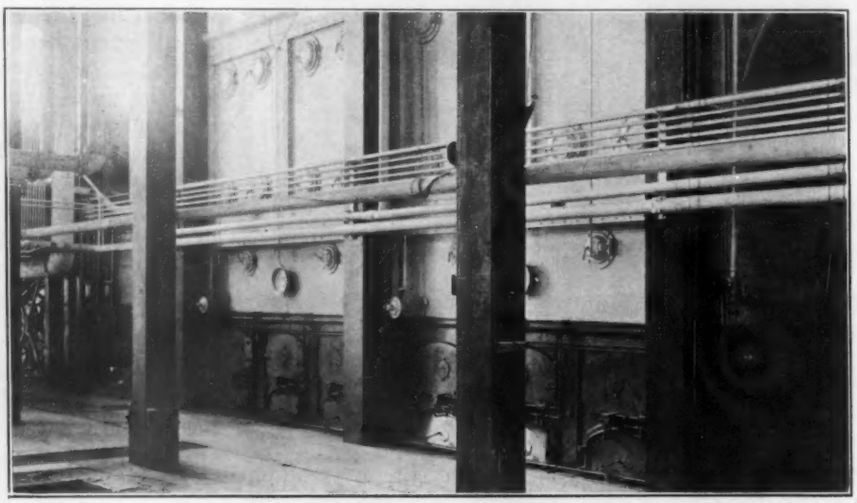
Here is a suggestion for a new avenue of lamp sales that should immediately net additional revenue to every contractor-dealer that is awake to its possibilities in his locality.

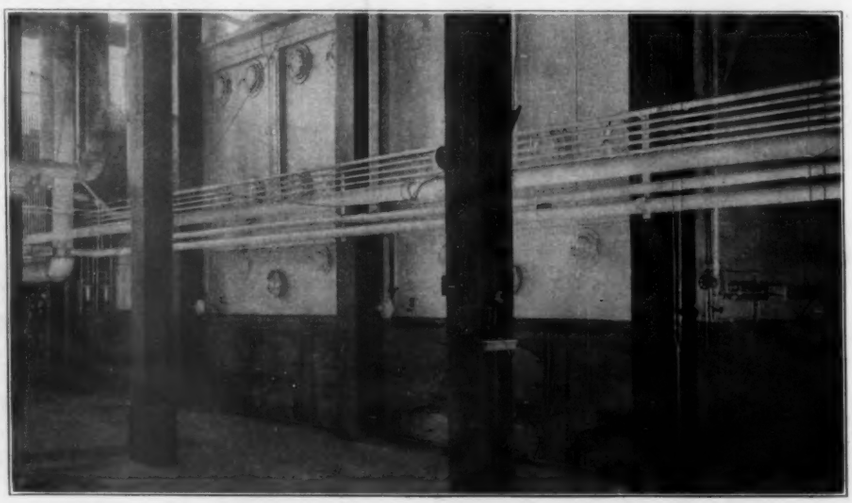
A new use has recently developed for the 500 watt Mazda lamp. Its use is in photography. Every photographer, engaged in the taking of interior views should purchase a 500 watt lamp. When the following brief is read it will be seen that the up-to-date photographer can not afford to be without this new equipment. Hence there is a new open door opportunity for the contractor-dealer in every locality of the West.

It recently happened that the editorial department of the Journal of Electricity was notified of a new invention by the Westinghouse Air Brake Company whereby a delicate control of fuel oil regulation is accomplished. In order to properly illustrate this new installation in the columns of the Journal of Electricity a photograph of the dark interior of the new Bush Street Station of the Great Western Power Company at San Francisco was necessary. The Pacific Photo and Art Company was engaged to do this work. The upper view shown in the illustration was taken by means of the methods formerly used in photography. It is to be noted that the controller at the side of the boiler on the right did not appear clearly in this view. A 500 watt Mazda lamp was next used by the photographer and by sweeping its effect against the darkened portion of the installation the desired clearing of shadows was brought about as shown in the lower view.

This unusual application of the 500 watt lamp opens up a vast field of new sales for the electrical contractor and dealer. The question is, who will be the first on the job in every community of the West to sell this new idea to the local photographer?

This is one instance of how alertness may be applied with profit to the contractor-dealer. Many other such ideas are daily presenting themselves to the trade and through the columns of the Journal of Electricity the contractor-dealer may expect to find useful hints in each succeeding issue.





BEFORE AND AFTER

The upper view is the best that can be obtained by flashlight—but note how the use of the 500 watt lamp in the lower picture has brought out the dark wall and controller device at the right.

THE CENTRAL STATION AND THE CONTRACTOR

BY W. R. PUTNAM

(That the central station is vitally interested in the welfare of the contractor is almost an axiom—and the central station man here points out that the contractor is interested in seeing the central station succeed as well. Very definite suggestions for co-operation are included in this article which covers in substance the address given recently by the author who is sales manager of the Utah Power & Light Company, before the Utah convention of Contractors and Dealers.—The Editor.)

There is no question but what there has been a wonderful change in viewpoint during the past generation. Today men have a realization that a successful undertaking is impossible in all kinds of industries unless you have the confidence and co-operation of the several branches of the industry. The success of central station undertakings is primarily dependent upon increased business and no central station can be successful in increasing business unless it has the assistance of all branches of the industry. The central station is first dependent upon the good will of its customers and second, upon the good will of the dealers and contractors in its territory.

WHAT THE CENTRAL STATION CAN DO

Finance installation work.
Advertise the use of electricity.
Co-operate with dealer in maintaining prices.
Frankly discuss mutual problems.

WHAT THE CONTRACTOR CAN DO

Help the Central Station to get fairer rates.
Concentrate on wiring, fixtures and appliances.
Better window displays.
Better shop arrangement.
Utilize Central Station advertising.
Talk over troubles with Central Station.

The central station industry has as its responsibility the most extensive use of electrical service, in the territory it is serving, that is possible. That is our aim. We, of course, are employing men whose business it is to secure this business. We have the same responsibility to our stockholders that you have to your stockholders. We must consider the money invested in our business that is entitled to a fair return.

One place where contractors and dealers can cooperate with the central station is in connection with this situation. You undoubtedly will be interested in knowing that the Utah Light & Power Company did not earn 6% on the money invested in its business during the past year. This is too small a rate of return. The only way that this can be increased is either by increasing business or by increasing the rates at which current is sold. The central station industry has been affected by the advance in cost of materials the same as your business has been affected, with this difference, that we are not in position to as readily raise rates as are you people. Possibly we will not be able to increase our business to the point where we can pay the increased cost of materials and labor and at the same time pay a reasonable rate of return on our investment. If such a condition happens, you men can be of wonderful assistance in helping the power company to secure whatever raise in rates may at that time be found necessary. You will owe it to yourselves as well as the central station to render this aid, as a central station in your territory which is in financial straits will be unable to finance the necessary power developments and extensions to care for increased business, with the result that there will be stagnation so far as the electrical industry in its territory is concerned which would result in decreased business for all of you men.

In reference to the division of work between the various branches of the industry the contractor and dealer should, without question, handle installation work in this territory. They also should be very active in the merchandising of all electrical goods including lamps and appliances. At present you men are handling practically all of the installation work on customers' premises, except in some of our small towns where you are not equipped for this work. As a result, it is our intention to keep out of this class of work. We also aim to have the sale of motors in our territory handled by the contractors and dealers.

As you know, we have assisted contractors and dealers in financing installation work from time to time, particularly with all house wiring. I will grant that we are not doing as much as we might in this respect, but unfortunately the central station industry has been hit harder than any other branch of the industry in the present financial situation. We cannot secure money for extension work out of our earnings. We must secure new money to finance all extension work and money is not to be had at this time. Undoubtedly when financial conditions reach normal we will be able to render you more assistance in financing deferred payment sales of larger appliances.

Probably the largest field for additional work on your part is in the sale of additional wiring, fixtures and appliances for use in the home. We all are interested in securing the greatest saturation possible. However, saturation as far as the use of electricity is concerned, will never be obtained. We owe to our customers, as well as to our stockholders, the securing of this business so that our customers will have better and more convenient homes. The central station in its advertising is trying to impress upon its customers, as well as prospective customers, the very many ways in which electric current can be advantageously used by them. This opens up the way for business on your part. The central station has felt that it was necessary for it to take a very active part in this class of merchandising and I appreciate that this activity has opened the central station to criticism by you men. However, you must appreciate that our duty requires us to adopt the quickest method of securing this business in order to increase our kilowatt hour sales.

Our company has been operating some five years in this territory. Our merchandising business the first year amounted to $97,000.00. The first eight months of this year we show an increase of 63% over the first eight months of last year and our total merchandise sales for the year will reach approximately a half million dollars. There is no reason why all of you men

should not have increases in your business in approximately the same proportion if you had taken advantage of the conditions.

The contractors and dealers in this territory are not at present properly equipped to handle this merchandising business. You are not ready to spend the amount of money every year required for advertising purposes; you do not have proper display rooms; you do not give the attention to window dressing that is required and do not have the floor salesmen and other facilities to take care of this volume of business. However, if you have followed the central station advertising you will note that the bulk of their advertising is directed to the education of the consumer as to the advantages of the use of electrical appliances and conveniences. This advertising does not aim primarily to secure this business for the central station, but endeavors to convince the customer of the advisability of purchasing appliances, of the use of better lighting and of all other types of electric service.

There is no reason why you contractors and dealers cannot secure very valuable assistance from this advertising of the central station. Allow the central station to continue the work of educating the public and center your advertising, which need not be nearly as extensive as the central station's, upon directing the attention of the electric customers to your store as an electrical center. Endeavor to secure as permanent customers, purchasers who will form a habit of using your store as their electrical center, their place for solving their electrical problems and the place at which they will make their purchases of all electrical goods. The greater number of such centers established in our territory the better we will be pleased.

You men should gradually improve the appearance of the sales floor of your stores and particularly of your windows. I appreciate the fact that most of you in paying a high rent for your stores are paying a considerable portion of that money for location and you are wasting that part of your expenditure if you do not take advantage of the location with attractive windows, changed frequently, and with arrangement of goods on your sales floor that has drawing power.

Possibly you have seen the analysis of conditions in San Francisco recently published. There it has been ascertained that the department stores are doing more electrical appliance business than all of the electrical stores in San Francisco. A similar condition is gradually developing in this territory and it behooves you men to exert your utmost efforts if you wish to continue the electrical merchandising business.

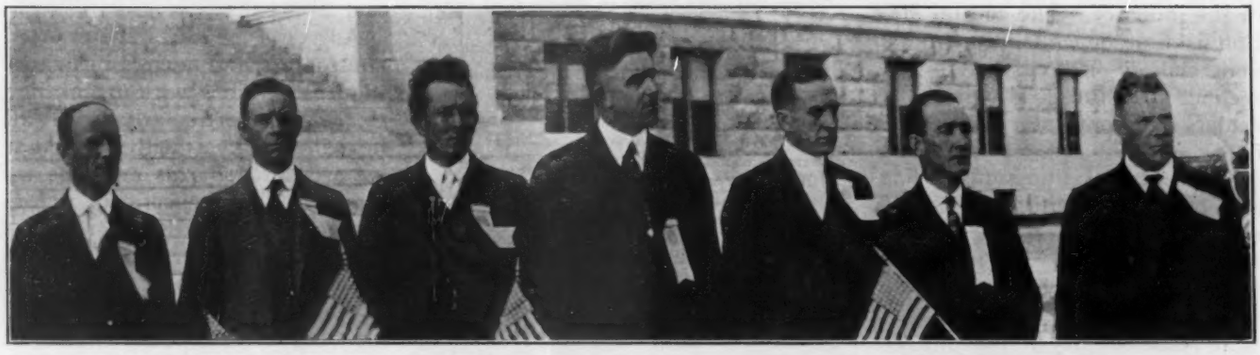
In reference to the amount of merchandising business that may be obtained in our territory: There is no reason why every household located where electric service is available should not spend fifty dollars per year for electrical equipment. In the state of Utah alone there are from sixty to sixty-five thousand homes using electric service. This means that at least three million dollars a year in wiring, electrical merchandising and electrical supplies should be secured from these customers. I doubt if one-third of that business is now done in this territory, consequently there is an immense field for development for new business here and it does not seem wise for any of us to quarrel over the question of who is entitled to this business, as long as we are securing only a portion of the total possible business.

The central station in this territory will continue to co-operate with the dealers in maintaining list prices. We know that no other course is advisable, except in connection with special campaigns. Good merchandising calls for these campaigns. If we are to be successful in merchandising, we must to a very considerable extent, adopt department store methods for this portion of our business.

I trust that this talk will result in a very frank discussion by you men of this subject. We honestly want and need the co-operation of you men and must have same if we are to succeed in our undertakings. Occasionally there will be complaints of our interfering with your particular field of business. Any time that these occasions arise we are ready to frankly discuss same and endeavor to adjust conditions, so that interference will not continue.

THE UTAH SOCIETY OF ELECTRICAL CONTRACTORS AND DEALERS

Here is a striking instance of how men of the electrical industry in the West are pulling together for the common good. By the linking together of all electrical contractors and dealers in the Utah district, each member hereafter will profit by the experience of a thousand workers, and it would be difficult to overestimate the helpful results that are bound to follow. This is only one instance of the marvelous co-operative spirit that is sweeping the West in all matters electrical.



Officers and Executive Committee of the Utah Society of Electrical Contractors and Dealers

Reading from left to right: G. J. Guiver, business manager; L. G. Robbins of the Robbins Electric Company, vice-president; J. V. Buckle of the Buckle Electric Company, president; E. H. Eardley of Eardley Bros. Company, secretary; G. W. Forsberg of the Inter-Mountain Electric Company, executive committee; N. L. Taylor of the Cache Valley Electric Company, Logan, executive committee; and E. A. Brough of the Montpelier Electric Company, Montpelier, Idaho, executive committee.

DEMAND FACTORS FOR MOTOR FEEDERS

BY F. D. WEBER

(The use of the demand factor in determining feeder sizes for motor installations is permitted by many electrical boards throughout the nation. In the northwest, especially at Portland, the use of charts has proven a quick and efficient method whereby the proper feeder sizes may be readily ascertained. Electrical contractors and dealers throughout the West will be keenly interested in following the details of the method in use at Portland as described in the following article by the electrical engineer for the Oregon Insurance Rating Bureau.—The Editor.)

General Conditions

1. A demand factor may not be used unless the nature of the installation is such that it is certain a diversion of operation will exist.

2. The demand factor curves which accompany these rules are not to apply to any feeder supplying less than five (5) motors.

3. No feeder will be permitted to be used with a rated current carrying capacity (see rule 18, N. E. C.) less than 50% of the sum of the rated full load currents (see tables on Motor Data) of all the motors supplied by such feeder.

4. In case the load on any feeder to which a demand factor has been applied, should for any reason become such as to repeatedly blow fuses of a capacity not less than the rated current carrying capacity of the feeder, such feeder must be increased to a proper size to permit the use of fuses of proper capacity to carry the load without overfusing the feeder as indicated by its rated current carrying capacity. Table A Rating of Rule 18 N. E. C. to be used.

5. The use of the word "fuses" in these rules is a general term applying to any standard approved current limiting device.

6. Whenever one motor in a group of motors equals or exceeds 50% of the remaining total connected load on the feeder, such motor must not be included in the groups used to determine the average demand factor for the feeder. Only the rated full load or starting current values taken from the Tables of Motor Data for such motor undiminished in any way shall be used in determining feeder capacity.

7. The "full load" and "starting" current values given in the Tables of Motor Data are not large enough for motors which start under full load conditions or greater, such as motors operating pumps, compressors starting or operating under full pressure, rock crushers, machinery having heavy fly wheels, etc.; unless these motors are especially designed for the service conditions under which they are to operate and are properly equipped with exterior resistance control. Such motors must not be included in any group for determining the demand factor of any feeder. They may, however, be used on the same feeder with other motors in connection with which a demand factor is permitted, but when such is done the full load or starting current values only of such motors must be used undiminished in any way for assisting in determining the feeder size.

8. The values of full load and starting currents as given in the Tables of Motor Data are for standard motors only operating at standard speeds of 1200 r.p.m. or 1800 r.p.m. Motors operating at speeds carrying from 600 r.p.m. to 900 r.p.m. must have such current values increased by 10%.

9. The type and make of motor as well as the ability with which the installation has been designed, are important factors in the demand which a given installation will make upon its feeder, and will always be taken into consideration in allowing a demand factor on any installation.

Note.—Motors of that type which will start without exceeding the full load rated current should not be penalized for starting current rating.

Method of Determining Demand Factor

10. For the purpose of determining Demand Factors, motors have been divided into four groups:

Group I includes motors ranging from 1 to 5 horsepower.

Group II includes motors ranging from 6 to 10 horsepower.

Group III includes motors ranging from 11 to 20 horsepower.

Group IV includes motors ranging over 20 horsepower.

Demand factor curves are given for each group.

11. In determining demand factors for a given feeder, the motors supplied by it should be arranged in accordance with their groups and data for the various sizes tabulated as shown in Table 1 for the typical problem worked out to illustrate these rules.

12. Take the number of motors falling in Group I, follow the sloping line until it rises to a point opposite the number of additional motors on the feeder, thence rise vertically until the curve for Group I is intersected. This point of intersection will indicate on the vertical scale at the left the demand factor to be used for this group. Repeat for each of the other groups. The average of these individual demand factors will then be the demand factor to be used for the feeder so far as the motors in the above groups are concerned. If there are any motors on this feeder that in accordance with preceding rules or for other good and sufficient reasons must be refused any demand factor rating, their full load values must be added to the value secured by means of the demand factors for the groups of motors given above.

The demand factor should be taken to the nearest multiple of 5%.

13. The next step will be to determine the current carrying capacity of the feeder. To do this, select one motor having the largest horsepower rating in the entire group, and from the Table on Motor Data determine the starting current for this motor. To this starting current value, add the sum of the full load current values (see table on Motor Data) of all the rest of the motors on the feeder; then multiply this value by the average demand factor previously determined. The resulting value will be that for which the feeder must be selected.

14. If there are any motors on the feeder that cannot be included in the demand factor group, the full

load current value of such motors must be added to the value of the remainder of the motors after the demand factor has been applied to them. The feeder must then be selected in accordance with this resultant current value.

15. If the motor with the largest horsepower rating on the feeder is not of such a nature that it may be included in the demand factor grouping, its starting current must be taken, to which must be added the sum of the full load currents of all other motors also not included in the demand factor grouping, plus the resultant value of the sum of the full load current values of all the motors in the demand factor grouping after applying the average demand factor. Such final value thus obtained must be used to determine the size of the feeder.

16. If more than one motor on the feeder has the same largest horsepower rating, the starting current will be taken on only one of them. If one of these motors is of a type such that it could not be included in the demand factor grouping and one or more of similar size could be so included, the starting current of the motor that cannot be included in such grouping must be taken.

17. To explain more clearly, if the largest horsepower rating on the feeder is a 50 horsepower, and there are three (3) such motors on the feeder, the starting current will be taken on only one of these motors, the full current being used for the others. If one of these motors is used for operating a pump and the other two for operating lathes or other machinery on which a diversity is known to exist, the starting current must be taken in connection with the pump motor; i. e., for the one which clearly cannot be included in a demand factor grouping.

Typical Problem

18. Determine the size of feeder to be used on the following installation of 3-phase, 220-volt induction motors:

4—1 h.p., 2—2 h.p., 3—5 h.p., 3—7½ h.p., 4—10 h.p., 3—15 h.p., 1—20 h.p., 2—35 h.p., 1—50 h.p. and 1—150 h.p. Further data shown in table below.

TABLE No. 1

220-volt, 3-phase Motors

Group	No. of Motors in Group	No. of Addit'n'l Motors on Feeder	Size of Motor h.p.	Full Load Current 1800 r.p.m.	Speed of Motor r.p.m.	No. of Motors on Feeder	Full Load Current Value for Feeder in Amps.
			1	3. amp.	1800	4	12.0
I	9	14	2	6. "	1800	2	12.0
			5	13.3 "	1800	3	39.9
			7½	19.5 "	1800	3	58.5
II	7	16	10	25.5 "	1800	4	102.0
			15	37.5 "	1200	3	112.5
III	4	19	20	50.5 "	900	1	*55.1
			35	87.5 "	1200	2	175.0
IV	3	20	50	123. "	1200	1	123.0
	Total 23						690.0
			150	362. "	1200	1	**362.0

*This motor falls in the slow speed class and must have its rated full load current as shown in second column increased by 10%. See Rules for Determining Demand Factors for Motor Feeders, Rule No. 8.

**Not included in total full load current values on feeder to which demand factor is applied because the capacity of the motor is more than 50% of the remaining total load on the feeder.

20. There are 24 motors supplied by the feeder, but since the 150 horsepower motor represents more than 50% of the remaining motor load, it may not be considered in the major group which is used to determine the demand factor. The major group, therefore, considered from the standpoint of demand factor purposes, consists of 23 motors.

21. Referring to horizontal scale on curve sheet, select the point indicating 9 motors and follow sloping line upward and to the right until it rises to a point opposite the position for 14 motors shown on the right hand vertical scale. From this point project a line vertically upward until it intersects the curve for Group I motors. The position of this point of intersection shown on the left hand vertical scale gives the demand factor to be used for this division of the motor installation supplied by this feeder. In this case it is 63%.

22. In the second group there are 7 motors and in addition there are 16 other motors on the feeder. Following the same procedure as for Group I, select point for 7 motors on horizontal scale; follow sloping line upward until opposite 16 motors on right hand vertical scale, thence vertically upward until curve for Group II is intersected. The point of intersection for this group is 60% as shown on the vertical scale at the left.

23. The third group contains 4 motors, leaving 19 additional motors on the feeder. Following the same procedure as for Groups I and II, the demand factor in this case is found to be 60%.

24. In an entirely similar manner, the demand factor for Group IV, which contains 3 motors leaving 20 additional motors on the feeder, is determined to be 45%.

25. Group I Demand Factor - - - - - 63%
" II " " - - - - - 60%
" III " " - - - - - 60%
" IV " " - - - - - 45%

4) 228%

Average - - - - - - - - - - - - 57%

Since this is nearer 55% than 60%, 55% will be used.

26. The total full load current on the feeder, not including the 150 horsepower motor, is 690 amperes. This value multiplied by 55% equals 380 amperes, which is the value to be used for the 23 motors included in the major group.

27. The current value for determining feeder size for the largest motor in any group must be the "starting current" value instead of the "rated full load" value.

28. The starting current value for the 150 horsepower motor is 452 amperes. (See Tables of Motor Data.)

Starting current for 150 h.p. motor..... 452 amp.
Demand factor current rating for balance of motor load..... 380 "

Total amperes for which feeder must provide 832 "

Size of feeder 1,500,000 c.m. R.C.

When No Single Motor Exceeds in Capacity 50% of the Balance of the Motor Load on the Feeder

29. This condition can be illustrated by taking the same installation as used previously with the exception that there is no 150 horsepower motor in this case.

30. The groups are therefore the same, the demand factors in each case the same, and the average demand factor is the same.

31. This time the largest motor in the group is a 50 horsepower motor, and the starting current for a 50 horsepower motor is 154 amperes.

32. The current value for determining feeder size is 154 amperes for the 50 horsepower motor, plus the full load current value of the remaining motor load on the feeder which is 567 amperes, giving a total of 721 amperes.

33. It has previously been determined, however, that a demand factor of 55% will be permitted on this installation, and the current for which the feeder must be selected will be $721 \times .55$ or 397 amperes.

Size of feeder — 500,000 c.m. R.C.

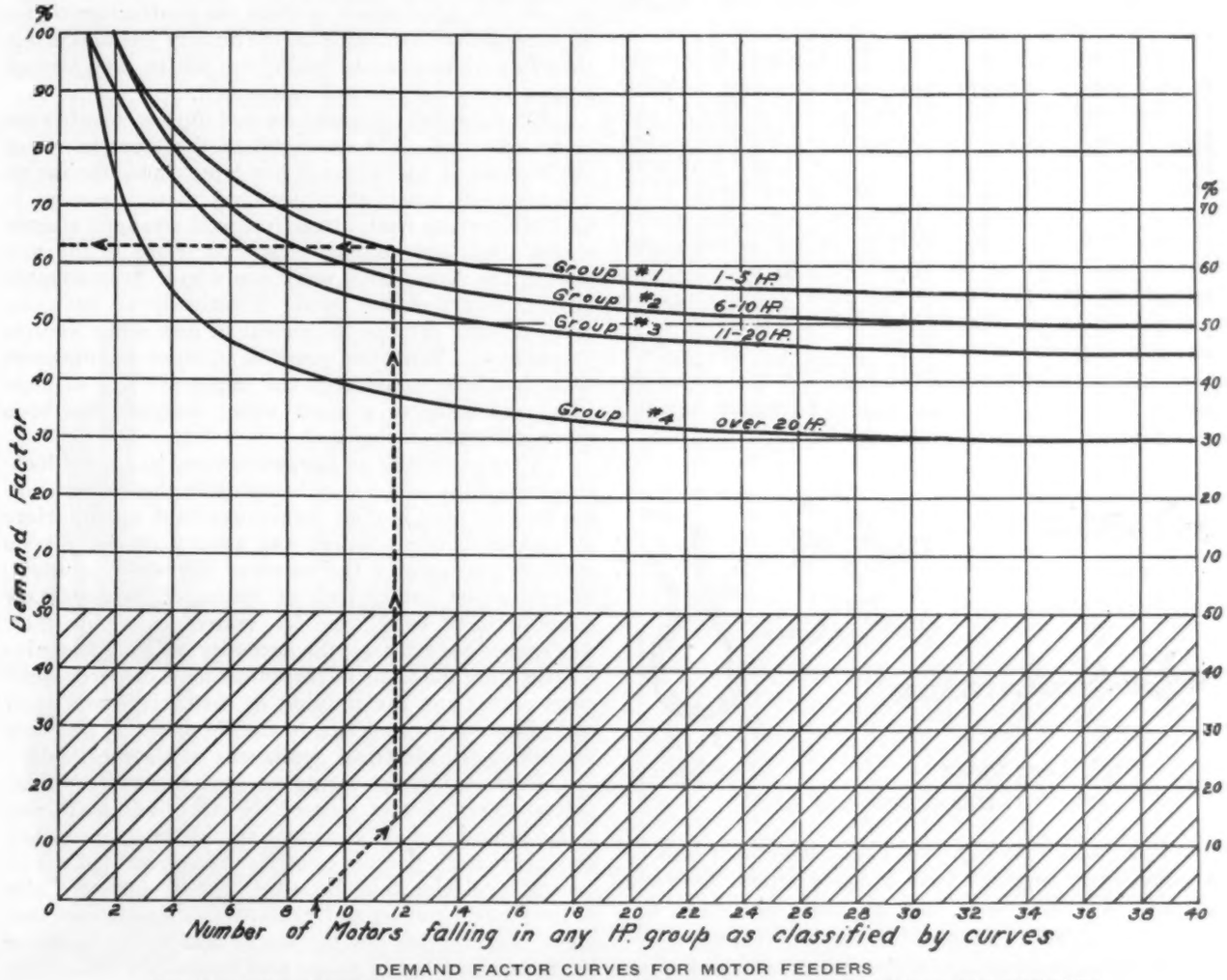
Feeder Sizes for Groups of Less Than Five Motors

34. The size of feeder for a single motor is given in the Tables of Motor Data.

35. For two, three or four motors the following method may be used: Take the sum of the rated horsepower values of the motors on the feeder, refer to the Tables of Motor Data, and select the first standard size of motor of the same type next lower than the aggregate value for the group. The size of feeder given in the Tables for the standard size of motor may then be used for the group.

36. To explain more clearly the method defined in the preceding paragraph, the following example is taken. Suppose it is desired to determine the size feeder necessary to supply the following 220-volt, 3-phase, alternating current motors: 1—25 h.p. motor, 1—10 h.p. motor and 1—7½ h.p. motor. The sum of the rated horsepower values is 42½ h.p. Referring to Tables of Motor Data in Addenda to Electrical Code, City of Portland, Oregon, the first standard size of motor next below this summation value is 40 h.p. The size of feeder for this size motor is No. 0 wire. If the motors to be supplied had been 1—20 h.p., 1—10 h.p. and 1—5 h.p. the sum of their values will be 35 h.p. and from the tables we find the size of wire for a 30 h.p. motor—the next standard size below 35 h.p.—is No. 1 wire.

37. Permission to take advantage of this reduction in size of feeder cannot be granted where it is evident from the nature of operation of motors that such a feeder size would be too small to permit proper fusing.



DEMAND FACTOR CURVES FOR MOTOR FEEDERS

Here is a series of curves for determining the size ofmotor feeders in buildings that have been adopted by the Electrical Board of Appeals at Portland, Oregon. The conditions governing the application of these curves, described in this article, should prove helpful in other localities of the West.

The Plotting of the Demand Factor Curves

Curves in the upper portion of the chart for Demand Factor are plotted from the following values obtained from the Chicago Edison Company, and checked by the experience of the Portland Railway, Light & Power Company.

DATA FOR PLOTTING DEMAND FACTOR CURVES

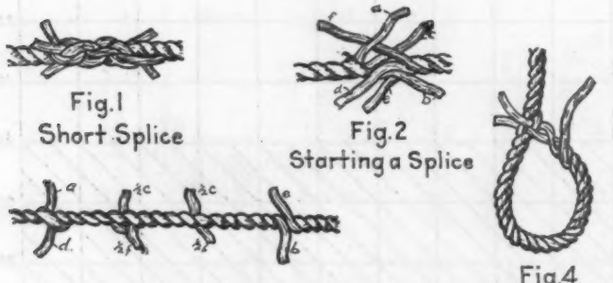
H.P.	No. of Motors	Points on Curves	Chicago Edison Demands Measured
1 — 5	1	100	86.
	2	100	69.
	4	84	83.
	8	69	66.
6 — 10	1	100	65.
	2	100	67.
	4	81	82.
	8	64	62.
11 — 20	1	100	62.
	2	90	66.
	4	75	69.
	8	59	63.
Over 20	1	100	53.
	2	75	37.
	4	56	53.
	8	43	45.

The lower curves are imperical and derived in order to consider "groups" of motors.

HOW TO SPLICE ROPE

The following directions for making splices in ropes are taken from a circular issued recently by the National Safety Council:

Short Splice (see Fig. 1). First unlay the strands of each rope to a convenient length and butt together the rope ends (see Fig. 2) having each strand of one rope lie between the two consecutive strands of the other rope. The strands of one rope should be drawn along the second rope and grasped in one hand. Then weave the free strands of the second rope in the strands of the first rope, working in a direction opposite to the twist of the rope. Similarly weave the strands of the first rope, and after continuing the process as far as desired, cut off the loose ends of strands. By cutting out a few fibers of a strand each time it is worked through the rope, the splice may be neatly tapered. The splice should be made smooth and compact by rolling under the foot or a board.



Figs. 1-4.—Methods of Making Splices

Eye Splice (see Fig. 4). Unlay the end of rope to a convenient length. Pass a loose strand between strands of the rope at a point that will make the proper sized eye. Pass the other loose strands between adjacent strands of the rope and proceed as in making a short splice.

THE CONTRACTOR-DEALER IN CALIFORNIA

BY R. M. ALVORD

(The first number of the "Bridge," an interesting trade publication recently initiated by the General Electric Company, contains a stimulating record of achievements made by the California Contractor-Dealers. The author is supply manager for that company in San Francisco—The Editor.)

In the early days of the California Association of Electrical Contractors and Dealers we heard much discusson on what various people—the central stations, the jobbers, the manufacturers—were going to do for them, but that soon gave way to more serious and thoughtful discussion on "What can we do to make our business better?"

The practice, more or less general, of doing the job as cheaply as possible was discussed pro and con, and many were convinced that in the building of a successful business the best policy is to figure on a quality job—one that will give the user the most service for his money and work fully as good as figured. The user, once shown that the quality job will give a service not to be had from cheap installations, is usually not a shopper for the cheapest possible jobs.

Then that important question "Costs" has been studied, analyzed, and reviewed. A thorough knowledge of costs including labor, material, and overhead and all that goes into it enables the contractor to give an accurate and fair price on the quality job, and is not, therefore, influenced to "skin" the job to save himself from a loss on a job underestimated.

On the retail sales end we find improvements even more apparent. The character of the store in which the woman is to purchase her lamps and appliances has received much attention, and there are now in California many neat, attractive, well arranged electric shops, while the number of similar shops in the first year of the Association work could have been counted on the fingers of one hand. Practically all have improved, some even to the extent of new store fixtures throughout. With the question of store arrangement there has been considered the important one of location; the value of a main street location has been more generally recognized.

After providing an attractive store in a good location comes the problem of bringing in the buyers, selling to them, and having them come back again. Here all phases of retail selling and advertising have been studied, particularly the value of the show window; the value, or rather lack of value, of the ordinary announcement card used by many dealers in their newspaper advertising; the necessity of being liberal—a little more than fair in the adjustment of purchasers' complaints; and the training of themselves and their sales force to give service to the shoppers by showing them how the electrical appliances will serve them.

Thus in buying wiring or appliances the public, better served, better pleased, is more willing to pay a fair price for good electrical service and more of it, and a greater use of electricity is promoted. The contractor-dealer thus becomes a more effective ally of the central station and, receiving a fair price including a proper profit for his wares and work, he keeps his finances in better shape and becomes a financially stronger, as well as a larger, purchaser.

TECHNICAL HINTS FOR BUSY MEN

DEPARTMENT CONDUCTED BY GEORGE A. SCHNEIDER

(A good motor and the best of wiring may leave the customer dissatisfied, if pulleys of the wrong size have been sent. The proper length of belting, speed of the motor, suitable foundations and other factors for which the contractor is responsible are often the determining factors in the success of the installation. A table of corresponding sizes, a formula for determining diameters and rules for other elements involved are here given for practical use.—The Editor.)

APPLICATIONS OF MOTORS TO PISTON PUMPS AND PUMP JACKS

A well known instructor and engineer once made the statement that electrical engineering is 90 per cent mechanical. This fact is pretty well proven in connection with many applications of motors and a great deal of trouble and expense would be eliminated if motor installations were more frequently considered to be a mechanical problem as well as an electrical one. No matter how carefully the motor and controlling devices have been selected and how well the wiring has been done, the installations will not be satisfactory unless suitable methods of transmitting the power of the motor to the device or machine to be driven have also been chosen. This latter factor represents the mechanical part of the problem. It involves the selection of the most desirable speed of the motor, the proper size of pulleys for both motor and driven machine, the proper length and kind of belting, suitable foundations and several other factors which are very frequently given little attention in making motor applications. Some of these factors and their relation to the application of motors to piston pumps and pump jacks will be briefly discussed, particularly those points which are most often brought up by the electrical dealer and contractor.

Generally the troubles experienced result from a desire to use 1800 r.p.m. motors to keep the first cost down to the minimum and a failure to recognize the fact that there is a minimum safe diameter of pulley for every motor depending upon the size, speed and design and that pump jacks and piston pumps are inherently slow speed devices.

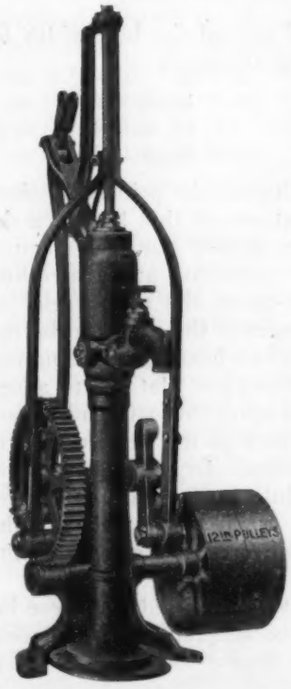


Fig. 1. Typical pump jack, back geared 6 to 1

A typical pump jack designed to permit the common form of pump which is ordinarily operated by hand or a wind mill to be driven by a belted motor or any other belt power is illustrated in Figure 1. These jacks are usually limited to 25 to 40 strokes per minute ; 35 strokes being a safe average. Speeds higher than this soon ruin both pump and jack and are not recommended. The driving shaft is usually back geared 5 to 1, 6 to 1, or 11 to 1. This means that with 35 strokes per minute the speed of the shaft and therefore of the jack pulleys will be 175, 210 or 385 r.p.m. respectively for the ratios just given.

Assuming that a motor having a full load speed of 1750 r.p.m. has been selected, this will mean a reduction between the motor pulley and pump pulley of 10 to 1, 8.3 to 1 or 4.5 to 1 depending on the gear ratio of the jack. This requires that the jack pulley shall then be 10, 8.3 or 4.5 times the diameter of the motor pulley to keep the number of strokes at 35 per minute. However the maximum ratio of reduction which may be used and give satisfactory results depends upon the power to be transmitted. For good practice the following reductions for belt drive should not be exceeded:

H.P. of Motor.	Ratio of reduction.
½ to 1 inclusive	10 to 1
1½ to 5 inclusive	8 to 1
7½ to 10 inclusive	6 to1

These recommendations will be found in several handbooks but several authorities limit the reduction for motors 1 h.p. and larger to 6 to 1 in any case. The best results will be secured by working within this limit.

With any ratio selected the size of pulley on the jack will depend upon the minimum diameter of pulley permissible on the motor. Where this diameter is smaller than a certain minimum, there is danger of injuring the bearing and shaft due to the heavy belt tension that would be necessary to transmit the full output from the motor. The standard size and minimum diameter of pulley allowable on a certain line of alternating current motors is as follows:

H.P. of Motor.	Full Load Speed	Standard Pulley. Diam.	Face.	Special Pulley. Minimum Diam.	Maximum Face.
½	1700	3½	2½	2	3½
½	1120	3½	2½	2	3½
¾	1700	3½	2½	2	3½
¾	1130	4½	2½	2½	4½
1	1700	3½	2½	2½	3½
1	1130	4½	2½	2½	4½
2	1700	4½	2½	3	4½
2	1130	4½	3½	3	4½
3	1720	4½	3½	3	4½
3	1135	4½	4½	3½	6
5	1730	4½	4½	3½	6
5	1140	5½	4½	3¾	7
5	855	7	5	4½	8
7½	1740	5½	4½	3¾	7
7½	1150	7	5	4½	7
7½	865	7	5	5	7

The standard pulleys will vary some for the different lines of motors, but the smallest allowable size is very much the same for all motors of a corresponding size and speed, so the above minimum diameter will be fairly safe for any make.

With these facts and limitations as a guide let us

apply them to an actual installation which came to the writer's attention several days ago. A customer ordered a pump jack specifying the catalogue number of a well known make which was shipped as ordered. Later on this same customer ordered a 2 h.p. 1800 r.p.m. single-phase motor which is regularly equipped with a 4½ inch diameter pulley. Later a special 3½ inch diameter pulley for this motor was ordered. Since the orders for pump jack and motor came in at different times they were not associated with each other and the question as to whether or not the two would work together was not brought up. However, a few days later the customer called by telephone and claimed that the wrong pump jack had been sent because the pump jack made about 70 strokes per minute which was of course too fast.

Investigation proved the jack as ordered had been shipped and further that it was equipped with a 14 inch diameter pulley and was back geared 6 to 1. With a 3½ pulley on the motor having a load speed of 1750 r.p.m. the jack speed would be practically 73 strokes per minute. The jack was finally exchanged for one equipped with a 12 inch diameter pulley and back geared 12 to 1. With the same motor pulley this gave the pump about 42 strokes per minute which was satisfactory.

It is apparent that to keep the speed of the original jack down to 42 strokes per minute it would need to be fitted with a 24 inch diameter pulley which was larger than could be applied to the jack without building a special structure to raise its base several inches above the floor level. It will be noted from Figure 1 that only a small increase in the diameter of the pulleys is possible without raising the jack above the floor level. It is better to use a jack with a higher ratio, say 11 or 12 to 1, but still better to use the lower ratio jack, that is 5 or 6 to 1 and a 1200 r.p.m. motor. In the long run such an equipment will give the best results.

A general rule is that motors of about 1750 speed can be used only with jacks of the larger ratio—11 or 12 to 1, while motors of about 1150 r.p.m. are generally satisfactory for reductions ranging from 4 to 1, to 6 to 1. Piston and plunger pumps work in most cases at slower speeds and slow speed motors either about 1200 or 900 r.p.m. must be used for the best results.

The correct diameter of pulley for the jack or the motor when the speed of the motor, the gear reduction and the number of strokes desired are known may be calculated from the following simple rules:

Let R = ratio of reduction in jack.
N = number of strokes per minute.
S = revolutions of motor at full load.
D = diameter of pulley on jack.
d = diameter of motor pulley.

Then
$$d = \frac{N \times R \times D}{S} \qquad (1)$$

$$D = \frac{S \times d}{R \times N} \qquad (2)$$

Example.—A piston pump back geared 12 to 1 is fitted with a 12 inch diameter pulley. What will be the diameter of the motor pulley to give the pump 42 strokes per minute if the full load speed of the motor is 1750 r.p.m.?

By formula (1)—

$$d = \frac{42 \times 12 \times 12}{1750} =$$

3.5 inches, practically.

In most instances it will be found that a special pulley on either jack or motor will be required to give the correct number of strokes. Since it is cheaper and almost always more convenient to change the motor pulley, the proper procedure is to first determine the minimum diameter of motor pulley that can be used after having found the size of motor needed under the conditions. Then find the diameter of the jack pulley from formula (2). Even with the smallest allowable diameter pulley on the motor in many instances the jack pulley must also be increased in diameter when a high speed motor is used. When the motor pulley is decreased from its standard diameter the width of the face should be increased in the same proportion so a wider belt may be selected to compensate for the loss that would otherwise result from the lower belt speed.

Assuming that the proper diameter pulleys have been chosen, care should then be taken to secure a proper distance between pulleys. This distance should be sufficient to allow a gentle sag of the belt when it is in motion. There are a number of arbitrary rules for determining this distance. One of them, which is probably quite conservative and safe, states that the distance between centers shall be not less than 5 times the diameter of the largest pulley except when there is a very large ratio of reduction. Distances determined by this rule will generally be satisfactory for practically all installations involving pump jacks or small pumps since the amount of power involved rarely exceeds 5 h.p. Single-ply leather or three-ply rubber belts will be required for most of these installations because it is not advisable to use double-ply belts with pulleys of less than nine inches in diameter, and one of the pulleys will usually be smaller than nine inches.

The pulley face should exceed the belt width by approximately the following amounts:

1 in. to 2 in.	by ¼ inch
2 to 5 inches	by ½ inch
5 to 12 inches	by ¾ inch

From the electric standpoint, the principal points involved in making installations of this kind are the selection of a motor of the proper size and starting characteristics, and suitable protective and controlling devices. Except in special cases, the motor selected should be large enough to permit the pump to be operated continuously without overheating of the motor. It is not good practice in these installations to adopt a smaller motor and depend upon the overload capacity and the intermittent nature of the service to prevent overheating in the motor. In selecting motors based on the intermittent duty rating there is always the danger of choosing a rating too small for the work and therefore possibilities of overloading the motor.

When single-phase motors are used for these installations they should be of the repulsion-induction type on account of the high torque developed at starting.

WOMEN IN THE INDUSTRY

A WOMAN ELECTRICAL DEALER

BY LILLIAN PALMER

(How a woman in the electrical industry has been able to overcome unfair conditions, form a stock company and interest her workers in the enterprise is graphically told in this article. The author is one of the best informed people in San Francisco on electrical fixtures, for she has studied them from an artistic, an engineering and a commercial standpoint.—The Editor.)

An attractive portable fixture

THERE is a little electrical fixture shop on Sutter Street near Van Ness Avenue in San Francisco which is known as the Palmer Shop. It is a woman's idea of how to handle the problems of an electrical dealer. The back of the establishment, to be sure, is given over to the making of the fixtures sold in the front salesroom, but aside from the manufacturing side of the business, the factors of location, of overhead, of advertising, the questions of display rooms and of reaching the avenues of trade are much the same as those met by any dealer in electrical goods.

The shop is not located on a main street nor does it present the appearance of an ordinary store. The idea throughout has been to follow the example of European metal shops in quaintness and attractive appearance. The primary object in securing the rather rough looking building was the lowness of the rent—and the smallness of this factor in the overhead makes much possible in the keeping down of prices. The rustic and hand wrought appearance of the front, however, has proved to be perhaps the main attraction of the shop.

The display window and salesroom are effectively combined in the burlap walled room which occupies the extreme front of the building. This is shallow enough to give the effect of a model room designed for the window shopper, and yet deep enough to serve for a salesroom to display fixtures to the actual purchaser. The idea throughout is to give the effect of an unusually attractive interior made so by the electrical fixtures used and care is taken that this display space be never overcrowded.

This is a woman's store, but the problems of securing help and of gaining their co-operation are no different than if I had been a man. I myself had begun my business career in a newspaper office and then as editor of a small magazine. Although I soon took over the writing of editorials, advertisements and even fiction so that other writers could be dispensed with, my salary was but sixty dollars per month. The man who held the job ahead of me received one hundred and fifty and he was discharged for incompetency! Right here, as an employer, I drew a lesson. In these days of close competition, when highest efficiency is a term on every lip, I realized that there is no greater leak in any office than a poorly paid employee. No motorist is going to drive a car if he can help it unless every cylinder is giving its full quota of power and the discontented man or woman is a knocking cylinder which, even in a large shop, may retard the smooth going of the whole machine.

I had been experimenting with metal work in spare hours and now, finding that the business could be made really profitable, turned to that entirely. Two years of independent work, of giving lessons—and a study trip to Europe brought me to the point where I was ready to open a business for myself.

I arrived home determined to put my knowledge to practical use by opening a shop such as some I had seen abroad where, by proper management, I thought individual work could be put on the market at a price within the reach of the average buyer.

Of course there was only one place to put my plans into action so I came to San Francisco with one order, a very light purse, a heavy box of tools and an ignorance that embraced every department of business, from credit and buying down to figuring on my own work. On looking back at my assets I am not sure but the ignorance was the most valuable of all, for it led me to carry to a successful finish things that no wise person would ever have attempted. Each day was so crowded with new mistakes to be made that I never made the same one twice; and I began to demonstrate that my theory was correct and that there is always a place for work that is out of the ordinary.

Each job brought others and with increasing work came the necessity for first one assistant and then others, both men and women, so, remembering my ancient grudge against unfair conditions, I formed a stock company, each worker receiving a fair salary and a certain proportion of stock. The plan has worked splendidly. Customers very often comment to me on the atmosphere of vitality and cheeriness in the shop, and the great amount of work turned out; it is because happiness is the greatest constructive force in the world. Another thing we have proved is that good work is a sexless thing. Any one buying a lamp from us does so because workmanship and design please him and he doesn't stop to ask if it has been made by a man or a woman. As a matter of fact it may have been done by either one or the other, or by both, according to whose time it fitted.

With the growth of the work, there arose another interesting complication: I discovered that there is another side to the electric fixture business beside good design, the engineering side. Indirect lighting had come in, with its accurate harnessing of light so that shadows may be placed just where a proper perspective requires. I was fortunate enough to secure the interest of a good engineer who not only lent me

books but personally superintended several jobs and even gave a stereopticon lecture to us all so that the workers knew what to avoid in making and hanging fixtures. And then for me the subject broadened even further:—there was the human eye to be considered and the effect of bad lighting upon the general health—an effect given by no means its rightful importance by the average designer. So I took a few lessons with a good oculist and learned not to throw brilliant lights on a white table cloth and not to tantalize a poor over-worked eye with a succession of deep shadows and unshaded lights.

The policy of the Shop has been from the first an insistence on the enthusiastic customer; mere satisfaction is not enough. It has not always meant money making for it has sometimes entailed endless exasperating changes that have eaten up profits. But it has been good advertising. We have done no single job, not one, that has not brought other work, often far removed from it, until now the Shop ships fixtures all over the country, two big orders going to the heart of New York City.

I think one great reason for our success is the personal consideration given not only to each house, each room, but where possible, to each occupant of the room. Not only is the decoration and coloring taken into consideration but the makeup of the family and their mode of life. Often as we discuss rugs and hangings and whether the maid will be exchanged for a Japanese boy—all intimately bearing on the choice of fixtures—a customer will exclaim, "Oh, why don't all electric fixture stores have women do the selling?"

One of my most difficult tasks has been in making the average owner realize the importance of correct lighting fixtures; that the whole character and livableness of a room may be militated for or against. Of course architects do know this and an increasing number of them are coming to us to put their own designs into metal, which our low overhead makes possible for the average client. Another branch of work that has rapidly grown is the lighting of houses built for sale, for builders have discovered that when a buyer is undecided between several houses her decision is almost invariably swayed by the house with individuality shown in electric fixtures. A great variety in colors and softness of light is obtained by a metal tapestry, an invention of the Palmer Shop.

Such is the history of the Palmer Shop up to date. when we like all other manufacturers, stand confronted with the greatest war the world has ever known and with conditions changing every day. One of our men has enlisted, another has gone to work for the Government. I think the answer will be more women, for we have already proved their efficiency, but also like other manufacturers, we can only say — quien sabe?

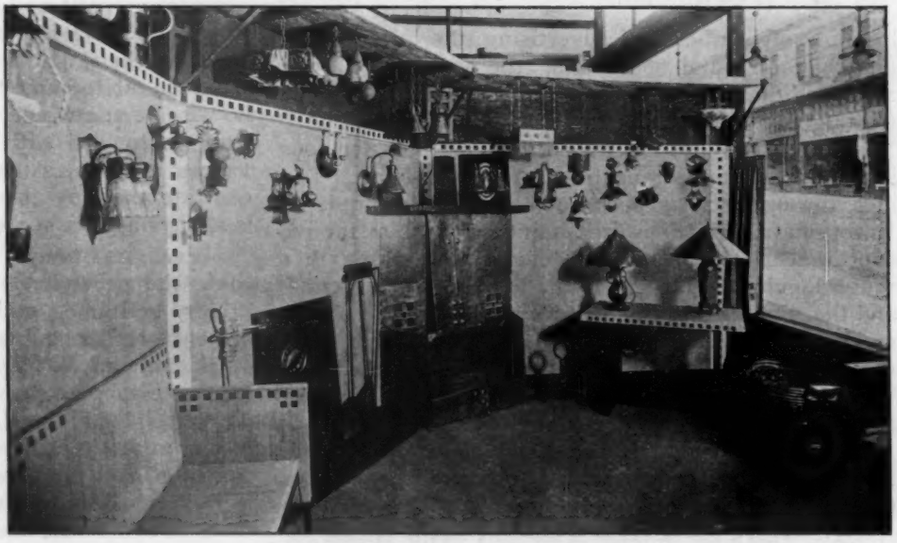
HIGHER POSITIONS FOR WOMEN

Women not only serve as operators with the New York telephone company, according to a recent article in the Bulletin of the League of Business Opportunities for Women, but the higher positions are open to them as well. The salaries of women in the telephone company's Traffic Department range from $9 a week to $35, and in some cases even higher. That the business woman there finds opportunity for more important work and accepts it is shown by the gradual rearrangement of the organization of the central office forces. In the early years each central office had a manager, an assistant manager and a chief operator, and manager and assistant were always men. Today, most of the central offices are in charge of women chief operators, who conduct the work with the aid of women assistants such as Supervisors and Senior Operators.

Besides the positions named above, the telephone company is opening up a few specialized positions to women and has already welcomed into its organization a number of college graduates.

GROWING NUMBER OF WIVES ARE WAGE EARNERS

More than one-tenth of the married women of the United States were engaged in gainful occupations in 1910, according to figures recently given out by the Bureau of the Census, and over 25 per cent of all women 16 years old or over were wage earners, business women, etc. Since 1910 the percentages undoubtedly have increased rather than diminished, for the tendency of women in this country has been toward greater economic freedom for many years. In 1900 the number of married women in gainful occupations was only 769,000, while in 1910 it was 1,890,000. The statistics referred to show that the proportion of women—married, single, and widowed—who are earning their living, is greater than ever before, but it is particularly interesting to find that of all the groups cited, the porportionate increase in the number of married women is the greatest.



INTERIOR OF THE PALMER SHOP

This artistically designed front room serves as show window and salesroom as well. There is no effect of crowding here and yet fair samples are given of the stock stored away in the rear.

FEMALE LABOR QUESTIONNAIRE

The National Commercial Gas Association, in co-operation with the Merchants' Association of New York, is seeking all possible information which may be of value to employers who are confronted with the problem of substituting female for male labor because of the present scarcity of male labor. In connection with this the N. C. G. A. is sending the following questionnaire to gas companies:

1. Have you had to substitute female labor for male labor to any appreciable extent? If so, what kind of work and to what extent?

2. Do you expect to be compelled to make such substitution in the near future?

3. Does substituted female labor receive the same compensation as the men formerly filling the positions, for the same amount of work, and how does the amount produced by women compare with the output of the men?

4. Has your experience given you any opinion relative to the type of work on which female labor can be substituted most satisfactorily?

5. Has your experience shown you any special problems arising from the substitution of female labor?

6. What has been the quality of the male applicants applying for positions with your company recently, and how do they compare with the men leaving your organization?

DID IT EVER OCCUR TO YOU THAT:

Although a woman is debarred from some few things on account of physical disability or prejudice on the part of the men with whom she must work, nevertheless there are women who are even good at machinery. Women are proverbially handy at the handling of an automobile, for instance; there are women garage managers and demonstrators of machinery. There is a woman member of the American Association of Mechanical Engineers who took hold of an unsuccessful cog wheel factory and where others had failed, put the thing on its feet through her personal supervision. There is no position in your establishment, unless it be one for which unusual physical strength or special technical training is required, which could not be filled by an intelligently selected woman in this emergency—although there are many positions, in which, for the woman's sake, you ought to hesitate to place her.

ENGLAND AND THE WOMAN SITUATION

The war has wrought great changes in the labor situation of the United Kingdom, but no factor is more outstanding in importance than the extension in the employment of women. The following figures, which are based on returns made by British employers to the Board of Trade, show the increase in numbers of women engaged in various activities which has taken place since July, 1914, and also the number of women who have directly replaced male employees:

Occupation.	Estimated number of females employed in July, 1914.	Increase up to April, 1917.	Direct replacement of men by women.
Industries	2,184,000	453,000	438,000
Government establishments	2,000	198,000	187,000
Agriculture in Great Britain (permanent labor)	80,000	.....	32,000
Transport	19,000	62,000	64,000
Finance and banking	9,500	50,000	48,000
Commerce	496,000	307,000	308,000
Professions	67,500	21,000	20,000
Hotels, public houses, cinemas, theaters, etc.	176,000	13,000	35,000
Civil service	66,000	89,000	83,000
Local government	198,000	47,000	41,000
Total	3,298,000	1,240,000	1,356,000

Thus the total number of female laborers is now 4,538,000. While the greatest number of women are employed in industrial work, the largest percentage of increase has taken place in Government offices, where only 2,000 women were employed in 1914, as compared with about 200,000 at the present time, a gain of 9,900 per cent.

Of the 4,538,000 women now employed in all branches, over one-half, or 2,637,000, are engaged in industrial occupations, and these are divided among the various industries as follows:

Trades.	Estimated number of females employed July, 1914.	Increase (+) or decrease (—) from July, 1914, to April, 1917.
Metal	170,000	+ 308,000
Chemical	40,000	+ 51,000
Textile	863,000	+ 22,000
Clothing	620,000	— 37,000
Food	296,000	+ 18,000
Paper and printing	147,500	— 7,000
Wood	44,000	+ 24,000
All other trades	103,500	+ 74,000
Total	2,184,000	+ 453,000

CALL FOR WOMEN STENOGRAPHERS

The United States Government is in urgent need of thousands of typewriter operators and stenographers and typewriters. All who pass examinations for the departments and offices at Washington, D. C., are assured of certification for appointment. Women especially are urged to undertake this office work. Those who have not the required training are encouraged to undergo instruction at once.

Examinations for the Departmental Service, for both men and women, are held every Tuesday, in 450 of the principal cities of the United States, and applications may be filed with the Commission at Washington, D. C., at any time.

ELECTRICAL TERMS ILLUSTRATED—I

If the woman in your employ becomes upset—

WHAT WESTERN INVENTORS ARE DOING

(If you have an idea, what should you claim in your patent so that no one may infringe on your rights? If the other man has a patent, how much has he left open for you to use? Questions of this sort and others relating to patents and inventions are considered in this interesting article. The authors are members of the firm of Prost and White, prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

BY WM. K. WHITE AND H. G. PROST

Invention

An invention is an idea of means for accomplishing an end. The inventive act is completed when the mental conception of an idea of means is followed by the embodiment of such idea of means in concrete form. Such concrete embodiment of the idea of means is termed a "reduction to practice" of the invention. The filing of a patent application is called a "constructive reduction to practice" of the invention disclosed therein and, for some purposes, is deemed the equivalent of an actual reduction to practice.

There is no idea that cannot be verbally expressed in a number of ways, each expression thereof being the equivalent of every other expression of the same idea. This is universally true. For instance, the idea that an object is round can be expressed in a number of ways. The same idea may be expressed thus: "Every point on the object's surface is equally distant from the center of the object." The same idea may be expressed in any of the foreign languages.

It follows there can be no generic expression of a generic idea. Every expression of a generic idea is only one of many possible specific expressions of such idea.

The foregoing is true in connection with practically all mechanical inventions which may be expressed by the use of mechanical elements. Where an inventor conceives an idea of means, it is almost always possible to express said idea of means in many different concrete forms, each the equivalent of every other. For instance, an inventive idea of means might be expressed or embodied in a machine, in which a weight is used for returning a movable part to normal position. However, such specific embodiment of the generic idea of means would constitute only one species of the invention. It is obvious that, in most cases, a spring could be substituted for the weight to perform precisely the same function in the machine. The machine, with a spring so substituted therein for the weight, would constitute another species of the generic invention.

In the law of patents, said weight and spring would be termed "mechanical equivalents"; and the machine, with the weight therein, and the machine, with the spring therein, would be equivalent expressions or concrete embodiments of the same inventive idea of means.

Letters Patent

The value of a patent, on an invention, depends on whether or not it covers the actual invention, in whatever form it may be expressed or embodied. The patent may be so worded as to cover only one of many forms, in which the invention can be embodied. In such a case the inventor practically dedicates to the public his whole invention, because the public, without infringing the patent, may freely use the invention when expressed or embodied in any of the equally valuable forms not covered by the patent.

From the foregoing, it will be seen that an inventor may make an invention of great value and yet fail to derive any profit therefrom by reason of filing a patent application so drawn as to cover only one specific embodiment of his broad invention.

The commercial value of a patent, therefore, depends upon two factors:

1. Upon the commercial value of the actual invention disclosed therein in respect to supplying a public want or need.

2. Upon the patent covering and protecting the actual inventive idea of means in every equivalent form in which the same can be embodied.

A patent on an inventive idea of means, capable of embodiment in a machine, comprises a document containing:

1. Drawings illustrating one form of machine in which the invention may be embodied. (Note: The Patent Office Rules do not permit one to attempt to illustrate all or a number of the various modified forms of machines in which the invention can be embodied.)

2. A specification constituting a description of the machine, shown in the drawings.

3. Claims.

Claims

The "claims" are the most important part of a patent. The breadth and scope of the monopoly, granted by the patent, depend upon the wording of the claims. The claims define the metes and bounds of the invention of which a monopoly is granted to the inventor.

A patent grants a monopoly of only that which is claimed. A deed to land grants only that which lies within the metes and bounds set forth in the deed.

A patent may disclose, in the drawings and specification thereof, a broad, pioneer invention. However, the monopoly, granted by such patent, may be only one specific embodiment of such invention, by reason of the inventor failing to claim all that he was entitled to claim.

A chain is no stronger than its weakest link; a patent claim is no broader than its narrowest limitation.

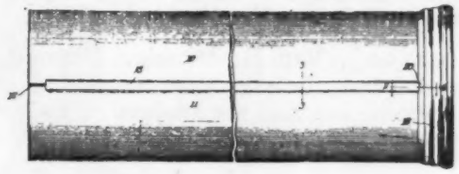
What can be but is not claimed in a patent, is dedicated to the public.

Each claim of a patent is, in effect, a patent on the subject matter thereof. One claim may be valid and another claim, in the same patent, be invalid. One claim may be infringed and another claim, in the same patent, be not infringed by the unlicensed manufacture, sale or use of a particular machine.

New Ideas from the West

Patent No. 1,240,957. **Manufacture of Cylinders, Pipes, etc.** William A. Doble, of San Francisco, assigned to Pelton Water Wheel Co.

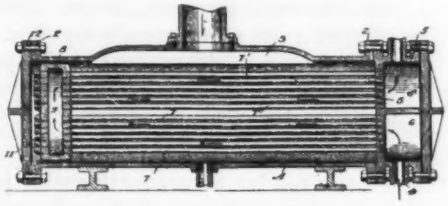
This patent covers a joint construction for securing together two pieces of metal or the opposite ends of a single piece of metal and while it appears simple, the issuance of



the patent is evidence of its novelty. In this invention, the two adjacent edges of the metal are butt-welded together and a strap is laid over the butt joint and welded at the butt joint and also welded to the plates at the edges of the strap forming three parallel lines of welding which insures a strong and tight joint.

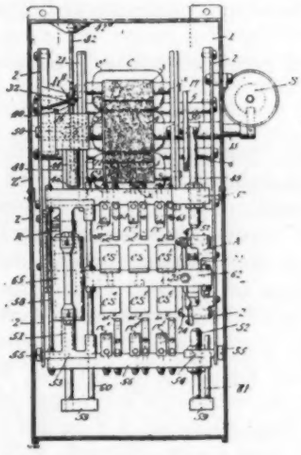
Patent No. 1,241,190. **Feed Water Heater.**. Carl. F. Braun, of San Francisco.

This invention comprises a shell, having a detachable partitioned feed head arranged at one end and a floating head arranged at the other end. The two heads are connected by nests of tubes seating in the inner walls of the heads and means are provided for allowing ready access to the tubes



for the purpose of cleaning, by providing a removable outer end on the feed head and providing the outer end of the floating head with openings which register with the tubes, the openings being normally closed by removable screw plugs.

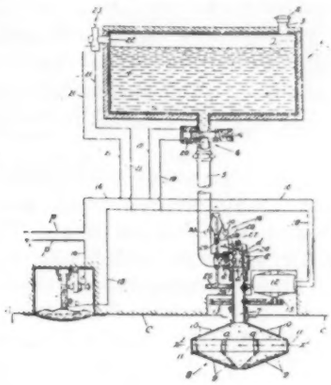
Patent No. 1,240,877. **Controlling Mechanism for Electric Motors.** Cleveland Redfield, Ogden, Utah.



This invention relates to a controlling mechanism for alternating current motors and judging from the number of claims which have been allowed, the mechanism must possess considerable novelty. The mechanism embodies a compensator comprising coils and a variable magnetic circuit, a switch for placing the coils in circuit with the motor to be controlled, means for varying the magnetic circuit, and a mechanism for controlling the speed at which the magnetic circuit is varied.

Patent No. 1,241,450. **Rotary-Sprinkler Thermostatic Fire Extinguisher.** H. F. Taylor, Los Angeles, California.

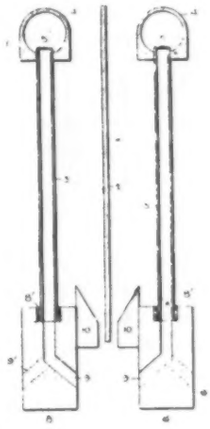
This invention relates to the automatic type of fire extinguishing sprinklers, which are thrown into operation by an abnormal rise of temperature. The sprinkler head is connected to the water supply pipes and is provided with a small motor for rotating it. The flow of water through the pipe is



controlled by a valve which is operated by a solenoid. The solenoid and the motor are connected in parallel to the supply leads, in one of which is arranged a contact-making thermostat. When the temperature rises above the predetermined maximum, the thermostat operates to close the circuit, energizing the solenoid and opening the water valve and simultaneously energizing the motor which rotates the sprinkler head. A governor is also provided for regulating the flow of water through the pipe.

Patent No. 1,241,967. **Electrolytic Apparatus.** Herbert R. Hanley, Winthrop, California.

The object of this invention is to provide means for brushing off the gas bubbles which adhere to the cathode in an electrolytic cell. To accomplish this, the anode is made



hollow and is provided with ports on its lower end, which lies adjacent the cathode, and gas is blown through the anode and the bubbles ascending through the electrolyte impinge on the cathode and brush the adhering bubbles from the cathode.

SPARKS—Current Facts, Figures and Fancy

(Electric trucks are already in use in New York for the delivery of mail, and now the Post Office Department is considering the use of trucks to handle the parcel post problem in rural districts. With the present necessity for the conservation of gasoline, a fruitful field seems to be opened here for the electrical vehicle. Most of the items of interest have a tinge of war coloring.—The Editor.)

Some farmer has invented a way of killing rats by attaching a hose to the exhaust pipe of his automobile and forcing the fumes down the rat holes. Another case of using the waste products.

* * *

We are getting used to the illuminated flag at night standing out against the sky. A miniature searchlight attached to the automobile hood to illuminate a miniature flag is the latest in electric devices.

* * *

Not only will this year's coal production exceed that of last year by 10 per cent, but it will exceed that of two years ago by 23½ per cent. These are the figures given Dr. Garfield by Prof. George O. Smith, of the United States Geological Survey.

* * *

Although it rains every day in Panama, the spring of the year is the dry season, October and November holding the worst record. Every month from May to the following January is included among those reported as the four wettest months.

* * *

The migration of 'plants' is now a factor in the electrical industry. An Alaskan power plant used in the coal mines originally came from England across Mexico at the cost of two and a half million dollars. Now it is being dismantled to be shipped to Japan.

* * *

The drawing room in many factories contains old tracings, on tracing cloth, which are of no further use. It is said that any laundry can wash and iron these so that the cloth becomes available for bandages. A company in Ohio has offered to wash such tracings in its shop laundry and turn them over to the Red Cross.

* * *

The first locomotive constructed on the Pacific Coast in a quarter of a century recently made its maiden trip over the Southern Pacific lines, having hauled part of the draft contingent from Sacramento to Oakland and thence to Roseburg, Ore. The locomotive was constructed in the Southern Pacific shops at Sacramento and is of the Pacific type.

* * *

Under a heading "Forty Years Ago Today" the San Jose Mercury-Herald reprints the following item from its columns of that time:

"A demonstration was given at the telegraphers' ball in Chicago, whereby persons actually talked over a wire on what was known as a telephone. It proved a great novelty and wonder."

* * *

About sixty per cent of our coal in this country is consumed by power plants and railroads. This passes through the hands of about two hundred and fifty thousand firemen. If these men were taught proper economy, Van H. Manning, director of the Bureau of Mines, believes that we could get along with something like half the amount. Another example of saving by pennies mounting into pounds.

* * *

A new opportunity for the electric truck is suggested by the experiments now being carried on by the Post Office Department looking toward increased efficiency in the delivery of mail. A bill has come before Congress to make aeroplanes rejected for war use on account of failure to pass speed tests available for such service. Motor trucks of all types are being considered as well.

* * *

The United States is not the only country which has forbidden exports. The Swedish Government has now prohibited the exportation from the country of all electrical machines such as generators, motors, converters, and transformers, and also parts of such machines, incandescent and arc lamps, carbon and metal filaments, current regulators, telephone and telegraph apparatus, and electro-technical apparatus, such as X-ray machines, wireless telegraphy plant, etc.

* * *

Here is a tabulation of the eight great causes of food waste—made out by the department of health of New York. Note how many of them would apply directly to waste in the electrical industry:

No terminal markets.
Duplication of marketing facilities.
Expensive cartage.
High retail delivery costs.
Unnecessary credits.
Extravagance in service and display.
Failure to buy home-packed goods of equal quality.
Failure of retailer to use proper merchandising methods.

* * *

Now that "summer-time" has come to an end, Germany is organizing new schemes of "daylight saving" for the winter, in order to economize fuel and artificial light. Notice has been given by the General in Command of the Munster Army Corps District that the consumption of gas and electric power in shops, restaurants, and so on must this winter not exceed one-half of the consumption in the winter of 1915-16. All the military and civil authorities, businesses, and other private undertakings are required to alter their office hours, from October 1st onwards, to the time between 8 a.m. and 4 p.m. Schools will keep the same hours. The lighting of shop windows and the use of passenger lifts are forbidden, and all restaurants are to be closed at 9 p.m.

PERSONALS

Lee H. Newbert, formerly in charge of sales for the Pacific Gas & Electric Company, with headquarters at San Francisco, has been appointed to head the commercial department of the company. The change has been brought about due to the resignation of Stanley V. Walton, head of the commercial department, announcement of which was made in the Journal of Electricity for October 15, 1917. In future the two departments will be merged into one unit. In the reorganization **L. F. Galbraith** and **R. E. Fisher** will assist Mr. Newbert in his work, in which Mr. Fisher's activities will in a great measure be concerned with the large power work. Much good for the electrical industry in the West is in store due to the prominence of the men in this department. Both Mr. Fisher and Mr. Newbert are at present most active members ot the San Francisco Electrical Development and Jovian League, the former as its first vice-president and the latter as a recent president. The best wishes of men of the electrical industry in the West go with them in their enlarged field of activity.

J. R. Thompson, a consulting engineer of Portland, attended the recent Logging Congress at Seattle.

J. C. Manchester, district sales manager for the San Francisco district for The Economy Fuse and Manufacturing Company, has located at 324 Rialto Building.

J. W. Oberender has again been retained as the secretary-treasurer of the Oregon Association of Electrical Contractors and Dealers and will in the future devote practically his entire time to the Association.

W. C. Wurfel, Pacific Coast manager of the Westinghouse Lamp Company, has recently returned to San Francisco from a visit to Southern California cities and has started on a business trip to Seattle and Portland.

J. F. Fenwick of the Hawaiian Electric Co., Ltd., with headquarters at Honolulu, is a Pacific Coast visitor and an interested onlooker at the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association.

W. B. Hall, of Pass & Seymour, with headquarters at Solvay, N. Y., is an interested Pacific Coast visitor. Mr. Hall was in attendance at the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association.

Samuel H. Taylor, manager of the Electric Railway and Manufacturing Supply Co. and president of the Pacific Coast Electric Supply Jobbers' Association, has left for Hot Springs, Va., to attend the Westinghouse Jobber Agents' meeting.

C. Jones, of the transformer engineering department, General Electric Company, Pittsfield, Massachusetts, is making a tour of the Pacific Coast visiting the district offices of the company at Seattle, Portland, San Francisco and Los Angeles.

Preston S. Millar, general manager of the Electrical Testing Laboratories of New York City, will lecture in Portland Nov. 20, 1917, before the Portland Section of the American Institute of Electrical Engineers on "Illumination as applied to street lighting."

Reuben S. Tour, associate professor of gas engineering at the University of California, has received a commission as first lieutenant in the Ordnance Department of the U. S. Army. Mr. Tour expects to see active service in his new field of duties in the near future.

F. D. Weber, chief electrical engineer of the Oregon Insurance Rating Bureau, Portland, Oregon, recently accompanied the representatives of the State Fire Marshals to the city of Albany as electrical expert, where a discussion had arisen over a report published by the State Fire Marshal's office. All differences were amicably settled.

Guy L. Bayley, who has been engaged on hydroelectric construction work for the Department of the Interior in the Yosemite Valley on the Merced River, has resigned to become assistant to the president of the Federal Export Corporation, 115 Broadway, New York City. Mr. Bayley's immediate work will be to establish the company in the Far East. He left recently for a six months' tour of Japan, Korea, China, Siam, the Straits Settlements, Java, Sumatra and way stations. He has had previous experience in this work, having represented the American Trading Company from 1900 to 1904 in Japan. Mr. Bayley was chief of the mechanical and electrical departments of the Panama-Pacific International Exposition. When the exposition came to a close he opened an office in San Francisco as a consulting engineer. Men of the West wish him godspeed in his new undertakings.

W. C. Wagner, electrical engineer with the Bureau of Standards, Washington, D. C., which is concerned with the standards of weights and measures, qualities of materials, standards of operation as well as standardization of physical constants, was in Seattle recently. He is taking a four months' trip through the West conferring with state commissions and other administrative bodies concerning public utilities in the matter of electrical safety of construction and operation, and incidentally of matters concerning electrolysis. These questions are taken up with public utility heads as well as universities. The trip is a special one and will be extended on down through Oregon and California. He was a guest of Superintendent of Public Utilities A. L. Valentine. Mr. Wagner visited the Seattle Engineers' Club at luncheon where he spoke briefly. He visited the Department of Weights and Measures at Olympia on his way south.

Newcomb Carlton, president of the Western Union Telegraph Company, together with vice-presidents J. C. Willever and W. N. Fashbaugh, and other New York and Pacific Coast officials of the corporation, visited Portland recently and made an examination of equipment and business records. There are few Western Union employes of Portland, other than messenger boys and mechanical men, who did not personally meet President Carlton. The Western Union officials have left for Seattle and Spokane. In the group were these company officials from the New York headquarters: President Carlton, Vice-Presidents Willever and Fashbaugh, Assistant to the President Lewis McKisick, and W. C. Merley, secretary of the party. Pacific division officials who came from San Francisco were: N. T. Cook, general manager; B. L. Brooks, general superintendent of traffic, and J. L. Ord, general superintendent of plant. Seattle district officers with the party were: I. N. Miller, superintendent; W. F. Schwandt, division supervisor of plants, and E. L. Ritter, superintendent of plant.

Fred D. Baker, formerly new business manager of the Sierra and San Francisco Power Company and of the Coast Valleys Gas & Electric Company, is now captain in the Quartermaster's Department of the United States Reserves, stationed at Fort MacArthur, California. Mr. Baker was the guest of honor at the recent Beverly Hills convention of the Pacific Coast Electric Supply Jobbers' Association and spoke feelingly of his former associations with men of the electrical industry in the West.

Arthur Williams, general commercial manager of the New York Edison Company, was appointed Federal Food Administrator for New York City on October 24th. He will work in close co-operation with the various committees and commissions and the Federal agent for the State in the solving of the food problems of this city. Mr. Williams up to the present has been chairman of the United States Food Administration campaign to enlist New York women as aids to the Food Administrator.

Albert S. Elliot, the widely known secretary of the Pacific Coast Electric Supply Jobbers' Association, has recently completed what is known as the "Elliot Drive." Not being content with the national reputation he won at the Hot Springs Convention of National Electric Supply Jobbers Association last spring, his admirers have called upon him from time to time to give notable lectures before the San Francisco Electrical Development League, the California Association of Electrical Contractors and Dealers; the Pacific Coast Electric Supply Jobbers' Association; the British Columbia Association of Contractors and Dealers; the Washington Association of Electrical Contractors and Dealers; the Oregon Association of Electrical Contractors and Dealers; and the Northwest Electric Light and Power Association. While scouting about Pasadena, after the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association, Miles Steel of the Benjamin Electric & Manufacturing Co. and S. B. Gregory of the Arrow Electric Company caught Mr. Elliot with his charming wife and daughter standing over the famous "Elliot Drive" sign in the beautiful residential section of Pasadena, which in view of the coastwise electrical activities of Mr. Elliot seems quite apropos as shown in the photograph above.

Tom Bibber of the Luminous Unit Company of St. Louis, manufacturers of Erascolite ware, is a recent Pacific Coast visitor. At the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association, Mr. Bibber proved so unique and so entertaining in his rendition of the eloquent man with the artificial arm that he was invited to assist at the Red Cross Smoker of the San Francisco Electrical Development and Jovian League on Nov. 1, 1917. Needless to say his pleasing personality has won for him a host of friends on the Pacific Coast.

R. H. Ballard, vice-president and assistant general manager of the Southern California Edison Company is receiving congratulations from all quarters over the masterly manner in which he recently handled the giant Liberty Loan campaign in Los Angeles and thus brought his section of the state into such favorable comment from all quarters. Incidentally Mr. Ballard acted as toastmaster at the recent Beverly Hills convention of the Pacific Coast Electrical Supply Jobbers' Association. After presenting a majority of the cups for golf supremacy to W. S. Berry, western salesmanager of the Western Electric Company, who has his headquarters at San Francisco, Mr. Ballard was glad to state that at least one or two cups, due to the exceptional climate of Southern California, had been won by men from Los Angeles and vicinity.

D. J. Butts, of the Western Electric Company at Los Angeles, **C. W. Chestnut** of the Western Electric Company at Seattle, and **R. S. Folland** of the Capital Electric Company at Salt Lake City, illustrated in the snap-shot shown herewith from the golf links at Beverly Hills, are typical instances of how men of the industry from every section of the West came together during the recent quarterly gathering of the Pacific Coast Electric Supply Jobbers' Association at Beverly Hills.

OBITUARY

George E. Scarfe, the well-known mining engineer and, for many years, power superintendent of the Nevada district of the Pacific Gas & Electric Company, died in Nevada City on the twenty-fourth day of August. Men of the electrical industry generally together with the residents of Nevada City and Grass Valley in particular bemoan his loss.

General H. N. Chittenden, U. S. A., retired, died in Seattle, October 9th. He was an engineer and a member of the Seattle Port Commission during an active construction period. He was the author of a series of articles on port improvements and contributed a notable report to the columns of the Journal of Electricity during 1916 on the Columbia River Report for the development of the water power at The Dalles.

CALIFORNIA WATER COMMISSION NOTES

Applications for water appropriations have been filed with the California State Water Commission as follows:

Thomas O'Brien of Lebec, 50 second feet of waters of Cuddy Creek in Kern county for use on 2500 acres. Applicant proposes two storage reservoirs, with two dams, 20 and 30 ft. high, respectively, and two main ditches a mile and three-quarters of a mile long, respectively. The estimated cost is $3500. The same applicant has also applied for permission to appropriate the same amount of water from Cuddy Creek, for the generating of energy with which to supply the town of Lebec, for manufacturing and other purposes. The works propose a dam of granite rocks and clay 30 feet high, with a main ditch 3 miles long. The total fall to be utilized is given as 750 ft. and the amount of power to be generated as 3500 theoretical horsepower.

J. Sank of Oroville, 28 cubic feet per second of French Creek in Butte county for the generation of electrical power for mining, manufacturing and other uses. The diversion works consist of a dam, timber crib, fifteen feet in height and a ditch, flume and pipe line 2½ miles long. The total fall to be utilized is 800 feet for the development of 2545 theoretical horse power. The estimated cost is given at $136,000. The water is to be returned to stream after use.

E. E. Lindsey of San Francisco, 30 cubic feet per second of Buck's Creek, tributary to N. Fork of Feather River, in Plumas county, for the generation of electrical power to supply electro-chemical manufacturing plant. The proposed diverting dam is 20 feet in height, timber crib, rock filled, and there is a flume, ditch and pipe line 3¾ miles long. The total fall to be utilized is given at 1400 feet and the amount of power to be developed as 4470 theoretical horse power. Water is to be returned to stream after use. The estimated cost is placed at $194,000.

MEETING NOTICES FOR ELECTRICAL MEN

(The Southwestern Society of Engineers, a new and enthusiastic gathering of engineers from Arizona, New Mexico and western Texas constitute the most interesting new gathering during the past semi-monthly period. The San Francisco Electric Development and Jovian League and the Pacific Coast Electric Supply Jobbers' Association have also been exceedingly active during this period. Other gatherings of men of the industry are also set forth in the following lines.—The Editor.)

Southwestern Society of Engineers

The Southwestern Society of Engineers on October 18-20, held a most interesting and helpful convention at El Paso, Texas.

The guest and speaker of the convention was Dr. Ira N. Hollis, president of the American Society of Mechanical Engineers and of the Worcester Polytechnic Institute. His principal address, "The Engineer in the Present War," emphasized that men, not inventions, will win the war, the keynote being struck in his words, "The blood of our children, the youth of America only, will solve this war. After all, it is not an Engineer's war —it's a war of industrial organization."

Dr. Hollis again addressed to the Society at the annual the convention at luncheon at the Ninth Engineers' Camp, Major O'Connor commanding. At this time he lauded the work of the United States destroyers in the war zone, stating they were far superior to anything in the British or German navies. He again spoke dinner that closed the formal session, the keynote of this address being that "America is a country of united people," quoting, "We have something now in the country the world has never seen before,—three thousand miles of people with the same thoughts and the same ideals."

The opening address, "The Engineering School and the War," by President Barnes, emphasized the lack of research and executive type of engineers, and the belief that the war will teach the schools the need of developing their courses to train men along these lines.

The address of Dean G. M. Butler of the University of Arizona upon "Some Effects of the Draft Law on the Arizona Mining Industry" very clearly brought out the problems that the Arizona companies have been facing during this great period of stress.

Nominations of officers for the coming year were made as follows: President, Dean G. M. Butler, University of Arizona; first vice-president, Dean S. H. Worrell, Texas State School of Mines; secretary, C. E. Barglebaugh; treasurer, R. W. Goddard. For Directors to serve three years, Mrs. W. E. Robertson and Gerald Sherman, the following officers holding over as Directors: Messrs. Barnes, Gillis, Gladding and Andros.

At the present time the membership of the Society is 119, and it is interesting to know that practically 20 per cent of the membership is now in war service. This, and industrial conditions in Arizona, brought about a smaller attendance than usual, but the enthusiasm and interest in the meetings made up in a large measure for the shortage.

The Board of Directors voted to hold the spring convention in Arizona, tentatively intending to have a traveling meeting at the principal mining camps.

San Francisco Section, A. I. E. E.

The meeting of the San Francisco Section of A. I. E. E. has been set for November 23rd at seven o'clock p.m. in the assembly room of the Engineers' Club, Mechanics Institute Building, 57 Post street. M. M. O'Shaughnessy, city engineer, will give a paper on the Hetch-Hetchy development, with particular reference to the hydroelectric features. This subject will undoubtedly prove of very great interest to all local engineers, for while the general aspects of the Hetch-Hetchy plan are fairly well known the real engineering features have not been fully understood or appreciated by many of our members.

Idaho Engineers to Hold Their Annual Convention

Dr. C. N. Little, dean of the engineering department of the Idaho State University, has been selected to preside at the annual meeting of the Idaho Society of Engineers this year. The engineers will give considerable attention to good roads and other kindred subjects at the time of their annual meeting, which will be held at Lewiston.

Spokane Section A. I. E. E.

The November 16th meeting of the Section is to be devoted to the "Industrial Application of Electricity" and will deal with the uses of electricity as applied to the automobile. The committee in charge are: R. S. Daniels, chairman, L. A. Lewis, J. P. Byron and E. M. Murphy.

The first meeting of the year was that of October 19th when Dr. E. O. Holland, President of the State College of Washington, gave a very fine address on "The Engineer's Responsibility as a Citizen."

Joint Meeting of the Portland Sections of the N. E. L. A. and A. I. E. E.

On November 20, 1917 Preston S. Millar will give an address on "Illumination as Applied to Street Lighting." This is a special meeting arranged in order that the sections may have an opportunity to hear Mr. Millar, when in the city.

Due to the national reputation and wide experience of Mr. Millar this lecture will undoubtedly prove of great interest to electrical men of the coast and a large attendance is expected.

The Oregon Society of Engineers

The second lecture of the course in Thermics was given by Prof. Otto Goldman of the Oregon Agricultural College, at the East Side Library, East 11th and Alder streets, Saturday, Nov. 3rd, at 8 p.m. This series of talks is proving most helpful.

BUILDERS OF THE WEST—XVII

GOVERNOR SIMON BAMBERGER.

The building of vast systems of power lines and electrified interurban railroads has been the potent factor in bringing about the triumph of the West in commercial and engineering lines of endeavor. Mountain top and desert alike have felt this helpful, invigorating influence. To Governor Simon Bamberger, builder and statesman in the great commonwealth of Utah, this issue of the Journal of Electricity is dedicated, in appreciation of his contribution to the West in the masterly development of the great intermountain district in which he lives.

PACIFIC COAST ELECTRIC SUPPLY JOBBERS' ASSOCIATION

Quarterly Meeting at Beverly Hills Hotel, October 25-27, 1917

GARNETT YOUNG, of the Telephone Electric Equipment Co., sending out a long one

CHARLIE HILLIS, of the Electric Appliance Co., with only 2 more holes to play. Is he ahead?

K. E. VAN KUREN, of the Westinghouse Electric & Manufacturing Co. Did it go into the rough?

C. B. HAWLEY, of the Intermountain Electric Co. He plays golf, too

When it is all said and done, the real essence of the meetings of the Pacific Coast Electric Supply Jobbers' Association is to be found in the splendid spirit of comradery that is developed at their sessions. This wholesome and revitalizing influence is later reflected in every nook and corner of the great West. The recent meeting at Beverly Hills was unusual for its setting. As a result of its session new life and new enthusiasm is added for the work ahead. Here is a list of those that attended, surrounded by characteristic poses of some of the men at this gathering.

BILL BERRY, of the Western Electric Company, demonstrates the "form" that won him a place on the famous Jobber's cup after nine years of faithful effort

At the open session on the closing day L. H. Newbert, head of the commercial department of the Pacific Gas & Electric Company, brought out the idea of absolute open play for all future activities in all branches of the industry as a necessity. This point met with unanimous approval. In the evening, the presentation of cups and the after dinner speeches following, made the good times at this gathering long to be remembered. Guests follow:

Averill, F. N., Fobes Supply Co., Portland, Ore.
Alvord, R. M., General Electric Co., San Francisco
Airey, F. J., Pacific States Electric Co., Los Angeles
Bacon, Lieut. (and lady), Quartermaster Ft. McArthur, Cal.
Baker, Capt. (and lady), U. S. R. Ft. McArthur, Cal.
Boring, Geo., Pacific States Electric Co., Portland, Ore.
Bibbins, T. E., Pacific States Electric Co., San Francisco
Bray, J., Western Electric Co., San Francisco
Berry, W. S. (and wife), Western Electric Co., San Francisco
Byrne, Harry (and son), Northwest Electric Co., Seattle, Wash.
Ballard, R. H., Southern California Edison Co., Los Angeles
Baker, C. G. A. (and wife), Baker-Joslyn Co., San Francisco
Butts, D. J. (and wife), Western Electric Co., Los Angeles
Bibber, T. H., Luminous Unit Co., St. Louis, Mo.
Burger, T. E. (and wife), Baker-Joslyn Co., Los Angeles
Bach, C. R. (and wife), Manhattan Electric Supply Co., S. F.
Case, J. O., General Electric Co., Los Angeles
Clapp, Ralph (and wife), Manufacturer's Agent, Los Angeles
Chestnut, C. W., Western Electric Co., Seattle, Wash.
Colkitt, J. M., of John Roebling Sons Co., Los Angeles, and 6 guests
Davis, C. C., Pacific Hardware & Steel Co., San Francisco
Deming, W. M., Journal of Electricity, San Francisco
Davis, L. W., Westinghouse Lamp Co., Los Angeles
Elliot, A. H. (wife, daughter and guest), Sec'y Jobbers' Ass'n
Folland, R. S., Capital Electric Co., Salt Lake City, Utah
Fenwick, J. F., Hawaiian Electric Co., Ltd., Honolulu
Graham, N. W. (and wife), Graham-Reynold Elec. Co., Los Angeles
Gregory, S. B., Arrow Electric Co., San Francisco
Hawley, C. B. (and wife), Intermountain Elec. Co., Salt Lake City
Harris, D. E., Pacific States Electric Co., San Francisco
Heise, Carl, Westinghouse Elec. Manufacturing Co., San Francisco
Hillis, C. C., Electric Appliance Co., San Francisco
Hall, C. B., Illinois Electric Co., Los Angeles
Howe, F. E., Pacific Hardware & Steel Co., San Francisco
Holabird, R. D., Holabird-Reynolds Elec. Co., San Francisco
Holabird, H. G. (and wife), Holabird-Reynolds Elec. Co., L. A.
Hall, W. B., Pass & Seymour, Solvay, N. Y.
Johnson, C. E., American EverReady Co., San Francisco
Jones, W. E., Economy Fuse & Mfg. Co., Seattle, Wash.
Jamison, J. H., Westinghouse Elec. & Mfg. Co., El Paso, Texas
LaMoree, C. D., Westinghouse Elec. & Mfg. Co., Phoenix, Arizona
Levensaler, W. M., Dunham, Carrigan & Hayden, San Francisco
Manchester, J. C., Economy Fuse & Mfg. Co., San Francisco
Murray, F. H., National Carbon Co., Los Angeles
Morris, J., Westinghouse Electric & Mfg. Co.
Murray, J. M., Illinois Electric Co., Los Angeles
McHugh, R. H. (and wife), Telephone Elec. Equipment Co., S. F.
Neelando, W. R., Southern Cal. Edison Co., Los Angeles
Northmore, E. R., Los Angeles Gas & Electric Corp.
Newbert, L. H., Pacific Gas & Electric Co., San Francisco
Neyland, A. G. (and wife)
Pence, D. C., Illinois Electric Co., San Francisco
Pomeroy, J. G. (and daughter), Mfrs. Agent, Los Angeles
Quinn, F. J., Manhattan Elec. Supply Co., San Francisco
Quintard, A. J., Luminous Unit Co., San Francisco
Oakes, R. F. (and wife), EverReady Co., San Francisco
Rawls, R. B. (and wife), U. S. Steel Products Co., Los Angeles
Reynolds, D. L., Del Mar Publicity, Los Angeles
Sherman, H. E., Jr., H. B. Squires Co., Los Angeles
Squires, H. B., H. B. Squires Co., San Francisco
Seaver, W. H., U. S. Steel Products Co., San Francisco
Sawyer, W. B., Jr., U. S. Steel Corporation
Steel, M. F., Benjamin Electric Co., San Francisco
Sibley, Robert, Journal of Electricity, San Francisco
Scheiber, H. K., Capital Electric Co., Salt Lake City, Utah
Taylor, S. H. (wife, daughter), Elec. R'y & Mfg. Supply Co., S. F.
Van Kuren, K. E., Westinghouse Elec. & Mfg. Co., Los Angeles
Vandergrift, J. A., National Lamp Co., Oakland, Cal.
Wiggin, C. E., Dunham, Carrigan & Hayden, San Francisco
Wurfel, W. C., Westinghouse Elec. & Mfg. Co., San Francisco
Wood, J. B., Pacific Hardware & Steel Co., San Francisco
Young, Garnett, Telephone Elec. Equipment Co., San Francisco
Youngholm (and wife), Elec. Ry. & Mfg. Supply Co., San Francisco
Zwaiful, H., Electric Appliance Co., San Francisco

TRACY BIBBINS, of the Pacific States Electric Company, setting the pace for his Foursome

F. H. MURRAY, of the National Carbon Co., explains that he is not "kidding"

BILL DEMING, of the Journal of Electricity. The green seems a long ways off

GEORGE A. BORING, of the Pacific States Electric Company. If I only had 'em on my home course!

The San Francisco Electrical Development and Jovian League

The meeting of the Electrical Development and Jovian League with the Downtown Association as guests of the San Francisco Advertising Club, held on Oct. 31, was one of singular importance because of the presence of the delegation from Congress on their way to Hawaii. Bursts of patriotic enthusiasm greeted statements by Representative Treadway of Massachusetts, that we are engaged in our own war for the sake of righteousness, justice and democracy, and by Senator King of Utah, that the American aviator Seegers was right when he said,

"It matters not when you die,
It matters not where you die,
But it does matter how you die,
And what you die for."

The Smoker, held on Nov. 1st at the Elks' Club was a success that fulfilled all the expectations of the large number present. Mr. Merle Smith of the Y. M. C. A. and located at the Presidio, sketched the methods used to relieve the monotony of a soldier's life, and to fill the eight hours during which he is free from discipline. Dependent upon how he uses this eight hours is the morale and efficiency of the army. The jovial Tom Bibber, from St. Louis, impersonated an old soldier and was heartily encored. After a xylophone solo by Ernest Tam, the evening was turned over to the meeting of the "Inductive Interference Commission" which was enlivened by many local hits. The following cast of prominent men took part in the "hearing":

INDUCTIVE INTERFERENCE HEARING
Thursday Evening, November 1st, 1917, Elks Building.

Cast

Watts (Janitor).....A. V. Thompson
Jots (Stenographer).....J. S. Thompson
Scoops (Reporter).....Robert Sibley
Shorty Circuit (Attache).....R. E. Fisher
D. I. Nough (Railroad Commissioner).....Nick Pendergast
Horse Power Pussy (Atty. for Great Wind Power Co.)..H. P. Pitts
Irate Francisco (Atty. for Specific Jass Co.).....Ira Francis
O. U. Rialto (Engr. for Phoney Company).....L. S. Ready
Al. Babcock (Engr. for Rail Roading Co.).....Miles Steel

Witnesses

Witness for Contractors.....C. F. Butte
Witness for Press.....Art. Halloran
Witness for Jobbers.....Al. Minema
Witness for Manufacturers' Agents.....Tracy Simpson
Voice from the Mob.....K. I. Dazey

At the meeting of Nov. 7th a memorable symposium took place. H. C. Reid, president of the California Association of Electrical Contractors and Dealers, introduced the speakers of the day, who spoke of the relations between the civic officers, the dealers, and the public. Arthur Kempston, chief of the Department of Electricity, San Francisco, called attention to the fact that most trouble is caused by misunderstandings and urged more frequent meetings. The Industrial Accident Commission was represented by Jno. R. Brownell, superintendent of the commission, who praised the support given by the various cities and by the electrical fraternity. Robert Eltringham, electrical engineer for the commission, explained the proposed state law for inspections and asked for any and all suggestions from the electrical industry. Carl Hardy, City Electrician of Oakland, illustrated the very important part in the molding of public opinion played by the small contractor, whose every action is reflected in the public attitude.

President Robert Sibley has appointed the following committees:

Finance and Public Policy: W. M. Deming, ch., H. F. Jackson, Carl Heise, T. E. Bibbins, W. S. Berry, H. C. Reid, W. F. Neiman, E. O. Shreve, W. W. Briggs, John A. Britton.

Reception:. R. E. Fisher, ch., D. E. Harris, Tracy Simpson, F. E. Boyd, E. B. Strong, W. R. Dunbar.

Attendance:. H. P. Pitts, ch., M. S. Orrick, C. E. Wiggin, W. C. Wurfel, A. Youngholm.

Entertainment:. Frank Rieber, ch., D. K. Lippincott, J. E. Warner, R. F. Behan, R. E. Fisher, H. P. Pitts, A. V. Thompson, Joe Thompson.

Editor Live Wire:. A. H. Halloran.

In Charge Local Publicity:. Nathan A. Bowers.

Membership:. Rod G. Guyett, ch., J. C. Manchester, L. H. Newbert, R. M. Alvord, Garnett Young, W. S. Coleman, C. F. Butte, A. E. Drendell, H. C. Reid, J. M. Barry, Miles Steel.

Illuminating Engineering Society, Chicago Section

A schedule of monthly meetings from November to June of 1918 has been prepared by the Chicago Section of the Illuminating Engineering Society which is to include talks by leading engineers, men of the trade and college professors. Prof. F. C. Caldwell of Ohio State University is to speak on "Preferred Proportions in Combining General and Localized Lighting" on the meeting of Thursday, Nov. 15th.

INFORMATION TO APPLICANTS FOR ENLISTED ORDNANCE CORPS

What It Is.—The Enlisted Ordnance Corps, National Army, into which the Ordnance Enlisted Reserve Corps has been merged, is charged with the supply, maintenance and repair of all cannon and artillery vehicles and equipment; all machines for the service and maneuver of artillery; all small arms, ammunition, harness, motor trucks, motorcycles, tractors and railroad cars; in fact, it is the Army behind the Army commonly known as "Service of the Rear."

Type of Men Wanted.—There is a place for practically every man who knows a trade in the Enlisted Ordnance Corps. Machinists, mechanics, plumbers, painters, carpenters, canvas workers, auto mechanics, saddlers, blacksmiths and wheelwrights are especially needed at this time.

Applicants must be between 18 and 40 years, citizens of declarants, and be able to speak, read and write the English language, should have no absolute dependents, and must be able to pass a physical examination conforming to that prescribed for the Regular Army.

Place and Type of Service.—If accepted for enlistment, men will ordinarily be sent to an arsenal school for a period of instruction, on completion of which they will be assigned to detachments, units or organizations, with ultimate service abroad. Previous military training, while preferable, is not essential, as men will continue the work which they pursue in civil life.

Pay and Grade.—In view of the importance of their work a large number of men will serve as non-commissioned officers. Original enlistment is required as private, but later courses of training or special qualifications quickly lead to higher grades. Pay ranges from $30 to $97.20 a month, depending upon demonstrated ability and place of service. Men enlist for duration of war only.

Free quarters, rations, clothing, bedding, medical attendance, etc. are provided.

Relation to the Draft.—Men registered under the Selective Service Law may voluntarily enlist prior to the posting of their names by their Local Boards. No man who has been called to appear for physical examination is eligible for enlistment in any branch of the military service. In case such men do enlist the department under which they have enlisted will be requested to discharge them and direct them to report to their local boards.

How to Enlist.—Get application blank by writing to Chief of Ordnance, Enlisted Personnel Division, Washington, D. C. Fill it out, return to Chief of Ordnance, and if there is an opening for you at the time, authorization will be sent you to enlist at the nearest recruiting station, and if accepted there, free transportation will be provided to place of service

HAPPENINGS IN THE INDUSTRY

New Power Loads

The Enterprise Foundry Company, at South San Francisco, has ordered two additional electrically operated steel furnaces, each of 350-kw. capacity, single-phase.

Camp Fremont is to be lighted by electric current. Each tent is to have a light, and all buildings and avenues are to be lighted. There will be about 25,000 or 30,000 lights.

During the past month the consumption of energy by the Municipal Railway system of San Francisco was 2,701,401 k.w.h., or an increase of over 100 per cent for the corresponding month of last year.

The work of laying the submarine cables across Islais Creek, at Third street, has been completed and the channel is now open to navigation. The massive steel Bastile drawbridge at the creek is operated by 440-volt power.

The Spring Valley Water Company has installed a 250-h.p. pumping plant at Bayview Road, near Menlo Park, for the supply of water to Camp Fremont.

Messrs. J. W. Plant, L. Gardella and T. M. Lane, owners of the Plymouth Rock mine, near Jenny Lind, Calaveras county, have announced their intention of erecting a large stamp mill on the property, which will require an additional installation of 150 horsepower, making a total installation of 200 horsepower.

Rapid progress is being made on the buildings at the big Electric Smelting Company's plant at Bay Point, California, and fires were started under two furnaces October 15th. Every part of the 20-acre tract is now having something built on it, or planned for it, and a model city is also being planned for the employes. Scores of cottages will be constructed. More than 15,000 horsepower will be needed to run the plant, and electric lines are being put in by three companies to supply power. The Bay Point plant will produce ferrosilicon and other alloys used in the steel industry.

Changes and Beginnings

Allen S. Halls is now the head of the National Electric Company, and has established his offices at 517 Railway Exchange Building, Portland.

Gilson Electrical Supply Co. has moved from 413 Fifth street, Oakland, California, to 304 Twelfth street. L. C. Gilson is general manager and A. H. Nylen purchasing agent of this concern.

The Electric Supply Company of Salt Lake City, Utah, have moved to 243-245 South State street, where wholesale and retail lighting fixture displays are housed in five separate rooms. The larger stock also includes auto accessories and a complete line of wholesale and retail supplies.

Carter Electric Co., Ltd., has recently opened up a store at 650 Granville street, Vancouver, B. C., which will handle the same line of work as this company's Victoria store, namely, wiring contracting, fixture and electric supplies. This company desires to secure catalogues from electrical manufacturers and jobbers. Harry D. Rees is secretary and treasurer.

Manager Mann of the Western Union Telegraph Company's plant in Fresno announces that the company has leased one of the stores in the new Mason block that is now being rushed to completion. The office will be located on the ground floor, while the plant department, or the receiving and sending end, will have quarters on the sixth floor of the building. The equipment has already been ordered.

Kellar-Thomason-Fleming Company, of Fresno, filed articles of incorporation as dealers in irrigation supplies, manufacturers and general dealers. Its capital stock is $10,000 with a board of three directors handling the business for the first year. On the board are George C. Martin, Rolla Coffeen and R. C. Fleming, all of Los Angeles. The principal place of business is to be Fresno. Henry Hawson is attorney for the company.

Deschner Electric Co., Inc., 906 Main street, Miles City, Mont., is the new name for Deschner's Electric Co., the business having been incorporated as of July 1st with a capitalization of $25,000, and a charter covering all branches of the electrical contracting, repairing and supply business. The officers of the company are A. J. Deschner, president; H. F. Deschner, secretary and treasurer, and Geo. K. Foster, A. H. Mork and Henry G. Ferncase, trustees.

Majestic Electric Development Co., 656-658 Howard street, San Francisco, early during the present year absorbed the Shoenberg Electric Co. of San Francisco, and is now marketing all the products formerly made by this company, in addition to the Majestic electric heaters, dental and surgical appliances heretofore produced by the Majestic Electric Development Co. The latter organization now operates branches at Philadelphia, Kansas City and Toronto, Canada. The branch at Toronto, Canada, is operated as a separate corporation, however, under the name of Majestic Electric Co., Ltd.

United Trading Co., 595 Mission street, San Francisco, has recently added to the list of Eastern factories which are now represented, the National Stamping & Electrical Works of Chicago, makers of electric water and coffee urns. The United Trading Company was organized last year by Max Loewenthal, E. Greenebaum and J. Thieben, owners of the Panama Electric Lamp Company. This company represents the following manufacturers: Menominee Electric Mfg. Co., Pittsburgh Electric Specialties Co., Swedish-American Telephone Manufacturing Co., Pioneer Corporation, Premier Electric Co., Ruvio Electric Co., on the Pacific Coast.

American Chemical & Ozokerite Co., formerly known as the Wasatch Ozokerite Co., miners of ozokerite at Soldier Summit, Utah, is building a chemical plant at Grand Crossing, Chicago, Ill., where ozokerite will be treated and manufactured. Ozokerite is a rare substance formerly imported from Austria before the war. It is plastic without being soft and hard without being brittle. It is used for insulation purposes and in the manufacture of insulators, telephone transmitters and receivers, for wax used to insulate electric cables and for various other purposes. The Utah deposit is the only known commercial deposit of ozokerite in the United States.

New Business

The Pacific Telephone & Telegraph Company of San Francisco has installed 500 new phones in the last 90 days.

During the month of September the Stockton division of the Western States Gas & Electric Company secured 214 new electric customers, among which were 17 power customers with a combined load of 215 horsepower in motors. During the same period 163 new gas customers were secured.

M. C. Baker & Son, The Electric Shop, San Francisco, have recently secured the contract for ventilating the Hippodrome Theatre with one of the new type noiseless air-cooled IIg electric motors. They have also constructed and built for the Hippodrome Theatre 4 toy balloon inflating machines which they are having made for their different theatres throughout the Pacific Coast.

Northern Electric.

In order to render possible the settlement of the troubles of the Northern Electric System petitions in involuntary bankruptcy have been filed again by Messrs. Leon and Louis Schloss, Mr. W. P. Hammon, E. J. de Sabla, Jr., E. R. Lilliendal as endorsers of the outstanding notices of the railroad company. It does not follow that the parties at interest will be declared bankrupt by reason of the proceedings. The action is to be taken merely as a means to an end.

Seattle Wins Earnings Case

Judge J. T. Ronald of the King County Superior Court at Seattle, Wash., recently sustained the city's demurrer to an amended answer in the action brought by the city of Seattle to recover $64,000, representing 2 per cent of the gross earnings of the Puget Sound Traction, Light & Power Company of Seattle during 1916. The company pleaded that it had petitioned the State Public Service Commission to be relieved of this 2 per cent gross earning tax and other franchise obligations, and claimed that the city was responsible for a loss of $70,000 or thereabouts through the passage of an ordinance requiring the sale of tickets on cars, later held invalid by the federal court. On Jan. 15, last, the company offered a check to the city for $64,000, representing 2 per cent of its gross earnings for 1916, with the provision that in accepting it the city abandon its plan of bringing suit to require the company to pave rights-of-way, assume portion of the cost of bridges and other obligations, which the company is seeking to have abrogated by the State Public Service Commission. The city of Seattle refused the check and directed Mr. Caldwell to bring suit to recover the amount.

Western States Gas & Electric Earnings

Earnings of Western States Gas & Electric Company, a Standard Gas & Electric Co. subsidiary, are reported as follows for September and year ended Sept. 30, compared with corresponding previous periods:

Month of Sept.	1917	1916	Increase	Per cent increase
Gross earnings.....	$118,052	$102,899	$15,153	14.7
Net earnings	54,363	49,926	4,436	8.8
Year ended Sept. 30				
Gross earnings.....	$1,355,484	$1,224,932	$130,551	10.6
Net earnings	635,148	584,929	50,219	8.6

San Joaquin Light and Power Earnings

The San Joaquin Light and Power Corporation has reported to the National City Company on earnings for the twelve months ended September 30. Gross and net income for the month and for the nine months' period show gains over 1916, but the increased cost of operation since the first of the present year is reflected in the earnings for the twelve months' period. Gross earnings for the twelve months showed a gain of $161,030 over the previous period.

Twelve months ended September 30—	1916	1917	Increase
Gross earnings	$1,843,668.58	$2,004,698.66	$161,030.08
Operating expenses, maintenance and taxes.....	708,469.13	851,750.60	143,281.47
Net income	$1,135,199.45	$1,152,948.06	$ 17,748.61
Interest charges	479,645.51	521,666.55	42,021.04
Balance	$ 655,553.94	$ 631,281.51	*$24,272.43

*Decrease.

Earnings of Utah Securities' Properties

The Utah Securities Corporation reports gross and net earnings from operation of all properties now controlled by the corporation, inter-company charges eliminated, for the twelve months ended August 31, 1917, as compared with the earnings for the same periods the previous year, were as follows:

	1917	1916	Increase Amount	Pct.
Gross earnings	6,237,064	5,306,547	930,517	18
Net earnings	3,393,952	2,909,888	484,064	17

Western Power Corporation

Gross and net earnings of the five companies comprising the Western Power system, for August, compare as follows:

	1917.	1916.
August gross	$331,825	$306,596
Net after taxes.....	209,828	191,515

Search for Coal in Eastern Idaho

In response to numerous requests of residents of Idaho an examination of certain reported coal fields in the eastern part of the state was made last summer by a geologist of the United States Geological Survey, Department of the Interior, in order that any coal land present in this part of the state might be classified and thus made available for local mining, so as to relieve the high prices and threatened scarcity of fuel. This work has just been completed, and the results are not at all encouraging so far as the development of a local supply is concerned.

The only productive part of the Teton Basin is the Horseshoe district. Though conditions in this district are such that large-scale development is impracticable, work now in progress will probably make possible a somewhat greater yield than that of last season.

Raise in Key Route Wage Schedule

The board of arbitration selected to adjust the wage controversy between the carmen and the San Francisco-Oakland Terminal Railways reached a unanimous decision recently, awarding the men a substantial increase in compensation. The new wage scale is approximately 12 per cent above the existing rate and will affect 1100 motormen, conductors and brakemen of the Oakland Traction Company and Key Route. The average rate of pay of the men at the present time is approximately $3.50 for a ten-hour day. The decision raises this to approximately $4 a day.

The award was signed by all members of the board—Paul A. Sinsheimer, chairman; John Drum and George Kaufman. Drum was chosen by the company, Kaufman by the men and Sinsheimer was selected as the third arbitrator.

Spillway and Hydroelectric Station

Erection of penstocks for the addition to the Panama hydroelectric station continued, and preliminary work was done for the erection of the headgates. Eighty tons of steel were erected in the building proper, practically completing this part of the work. Concrete placed during August amounted to 522 cubic yards.

The net output of the hydroelectric station during August was 4,730,300 kilowatt-hours. The ratio between water used for power and for Gatun Lake lockages was 2.39 to 1. Water wasted over the spillway amounted to 17,710.54 million cubic feet. Rainfall over the lake surface, 13.97 inches, was the highest recorded for August. It was 32 per cent above the 7-year mean.

Limit of Service Required from Public Utility

Although a person may live within the corporate limits of a city, that does not justify him in demanding service from a public service corporation if the income in sight would require ten years to reimburse the company for the expense of installation without anything for upkeep, service or depreciation, rules the public service commission in the case of George F. Yantis against the Olympia Light & Power Company. Yantis lives within the corporate limits of Olympia. He wanted light service, but the company refused to install it owing to the cost. The company did agree to put it in if he would buy two shares of capital stock to provide the money. This he declined to do and appealed to the commission. The commission holds it would be unreasonable to force the company to spend the money to serve him.

LATEST IN EVERYTHING ELECTRICAL

(The plans of the Society for Electrical Development for a Christmas campaign in place of Electrical week are today occupying the center of interest in things electrical. A new type of brake, an outdoor cable terminal and other recent devices are here included.—The Editor.)

AN OUTDOOR CABLE TERMINAL

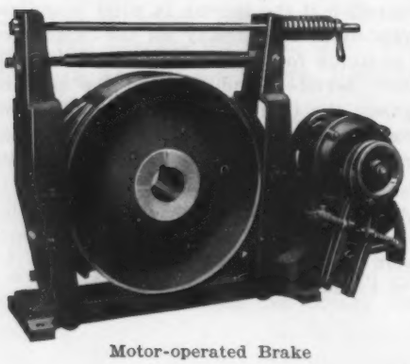
A new style of outdoor (Type D.O.A.) cable terminal has recently been placed on the market by the Standard Underground Cable Co., Pittsburgh, Pa. It is known as the Protected Disconnection style. All the copper parts are covered by a porcelain hood, as shown in the illustration, which permits the disconnection of the aerial extension wire even while the circuit is alive.

Outdoor Cable Terminal

All the outdoor (Type D.O.A.) cable terminals made by the Standard Company are readily disconnected from the aerial conductor either by means of a set-screw, a cap-nut or turnbuckle stem. The stem of the new terminal is a modification of the regular cap-nut stem and has some additional advantages where frequent disconnection of the aerial circuit from the terminal is necessary. The new terminal, as well as the complete line of Standard outdoor cable terminals, is fully described in Bulletin No. 700-2, which has just been published and is now ready for distribution.

NEW TYPES OF BRAKES

Types RS and M are the terms designating an alternating current, motor-operated brake and a direct current magnet-operated brake, which have recently been gotten out by the Cutler-Hammer Company. The alternating current brake with motor operation has been generally found to be more suitable than one depending on solenoid or magnet operation because of the inherent characteristics of A.C. solenoids being unsuitable for braking service. The motor-operated brake is silent in releasing, in applying and while held released. A high torque squirrel cage motor is employed geared to a toothed sector which is linked to the arms carrying the brake shoes. When power is applied, the motor revolves until the brake is released. It then stalls and maintains the brake in the released position until power is cut off. One of the outstanding features to be noted is the ease of making adjustments of brake for wear by means of simply turning a nut on the end of the thrust rod which is the upper rod shown in the accompanying illustration. This adjustment is required only two or three times during the life of the brake lining. These brakes are made in sizes ranging from 8 to 30 inches with ratings up to 250 h.p.



Motor-operated Brake

The direct current magnet or solenoid brake is similarly constructed but has a magnet in place of a motor, the D.C. magnet being eminently suited for brake operation. Six standard sizes ranging from 8 to 27 inches with horsepower ratings like the motor-operated type RS brake mentioned above. Brakes of this construction are particularly suited for severe service.

AN ELECTRICAL CHRISTMAS

This year instead of Electrical Week, the electrical industry is launching a campaign for an Electrical Christmas. Under the auspices of the Society for Electrical Development, members and non members may avail themselves of the posters and other sales helps. The society's November Sales Service includes concrete ideas on how to plan and carry out local campaigns to make them successful. Colored lithographs, window and price cards, poster stamps, illustrated newspaper cuts, window displays, sales-letters, and lantern slides are being furnished without cost. Also two new one-act Christmas movie films have been gotten out with the emphatic suggestion "Give Something Electrical This Christmas!"

NEW BATTERY FOR ELECTRIC POCKET LAMPS

A new dry battery for electric pocket lamps has been invented by a citizen of Zurich. It is said to be cheaper, better, and of simpler construction than those now in use. Instead of a single block battery it consists of three separate and distinct elements, which are placed side by side in the metal lamp case. The chief improvement is the possibility of substitution for a single element in case the battery is out of order.

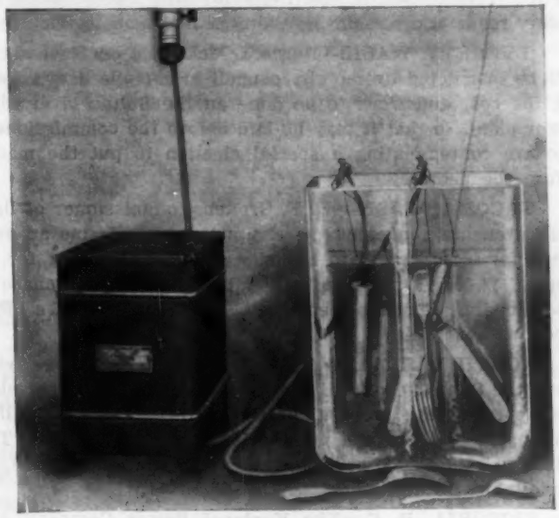
In the event of the battery becoming defective, the voltage of each element is tested to ascertain which one is useless, and it may then be replaced by a single new element. Naturally the cost is considerably reduced. Another important improvement is the possibility of using the new battery in connection with almost any pocket-lamp case now in use.

A factory installation consists of an eccentric press, a drying oven, a brush-cleaning machine, a galvanic copper bath, and a filling machine, the total cost of which in Switzerland is estimated at $2,500. Such a factory is said to be capable of producing daily 30,000 elements, or 10,000 batteries.

The cost of materials per element to the manufacturer is 0.4156 cent or 1.247 cents per battery in normal times, and 1.0436 cents per element or 3.131 cents per battery today. All the raw materials without exception are said to be available in the United States, and it is even assumed that they are less expensive there than elsewhere.

THE NEW TUNGAR RECTIFIER

A new type of alternating current rectifier has been recently perfected at the research laboratories of the General



Tungar Plating Device

Electric Company and standardized in several convenient commercial types.

While alternating current is all right for light and power, in a great number of instances, such as storage battery charging, electroplating, etc., only direct current can be used. And, in most cases, only alternating current is available in cities and villages where there is electric service. So the demand for rectifiers, especially in the smaller sizes, is very large.

Tungar Bulb

The new "Tungar" rectifier is a hot cathode, argon gas-filled device. The principle is entirely new, although it has long been known that a vacuum tube containing a hot and a cold electrode asts as a rectifier. The device consists of a small glass bulb, similar to an incandescent lamp, in which the rectification takes place; a little compensator, or transformer, which reduces the alternating current without wasteful resistance; a fuse and an enclosing case. The Tungar rectifier bulb, filled with an inert gas, at low pressure, contains a low voltage tungsten filament and a graphite "anode." These glass bulbs are inexpensive and will last for hundreds of hours of service.

These rectifiers may be used for charging all small storage batteries, such as used for miners' lamps, inspectors' lamps, dentist lamps, exit lights, electric piano players, burglar alarms, railroad signals, lighting systems of bicycles, motorcycles, motor boats and carriages; ignition systems on automobiles, stationary gas engines and tractors; fire alarms, call bells and buzzers, telephones, etc.

BOOKS AND BULLETINS

Miscellaneous

Transmission Line Coordinate Paper is advertised in a recent Bulletin issued by Raymond S. Brown of Columbus, Indiana. It is designed to afford transmission engineers an exact method for finding the electrical conditions at any point of an alternating current transmission line when the conditions at some particular point are known.

"The Manufacture of Gas," a bulletin from the Census bureau covering the statistics for this industry in 1914 has recently been issued.

A Census Bulletin, listing and tabulating the manufacture of electrical machinery, apparatus and supplies in 1914 has been given to the public and may be obtained by application to the Bureau of the Census.

The Agricultural Department of the University of California has recently issued a 14 page booklet on the "Control of the California Ground Squirrel" in which it is pointed out how this rodent which seriously affects irrigation and consequently related electric problems, can be effectively destroyed. Joseph Dixon is author of the paper which can be sent for under the title 'Circular No. 181.'

The United States Bureau of Standards has issued an outline of work which has been done in a study of the standards of good practice and good service as applied to public utilities. The branches of the main subject include standards for electric service, standards for gas service, standard methods for gas testing, National electrical safety code, electrolysis mitigation and other activities.

Joseph K. Choate's address before the American Electric Railway Association on "Increased Income for the Electric Railways" has recently been put into pamphlet form.

War Conditions in the Industry

"Why the War Must Go On" is the title of a booklet recently published by Hodder & Stoughton, Publishers of London, giving the English point of view.

"Organizing a Democracy for War" is the title of Bulletin No. 25 issued by the United States Chamber of Commerce.

According to Bulletin No. 6, gotten out by the Trade and Technical Section of the Public Information Bureau, retail merchants of the United States are volunteering window displays to aid in the food-saving campaign. Prizes have been offered for the best windows in different sections of the retail trade. The contest is being conducted by the United Publishing Corporation, of New York, in co-operation with the United States Food Administration, and covers dry goods, hardware, house furnishings, and other trades.

"British Railways and the War," by F. A. McKenzie, published by the Menpes Printing and Engraving Company of London, contains a study of English railway war and after-the-war problems.

BOOK REVIEWS

Hopwood's Living Pictures

by R. B. Foster; size 6 x 9 in.; 370 pages; published by the Hatton Press, London, England and for sale by the Technical Book Shop, San Francisco. Price $2.50.

The development of the moving picture from the early days of the kinetoscope to the modern up-to-date machines is a history of such fascination that this book must appeal to the general public as well as to the specialist on the subject for whom it was designed. It is a revision, or rather, re-writing of Henry V. Hopwood's earlier book on the subject, comprising the historic evolution of the cinematograph much as in the earlier work, and in addition, throughout the major portion of the book in fact, dealing with such subjects as Present Day Apparatus, Pictures in Colors, Speaking Pictures, Legal Matters, Manipulation and Practice, the Question of Copyrighting and like matters. The book is addressed to the manufacturers of moving picture materials and to others actually engaged in the industry, but it is not too technical for the ordinary reader.

NEW ELECTRICAL DEVELOPMENTS

(A proposed power plant which is to supply electricity to a railway in Montana, increasing demands for electricity for farm purposes in the great California valleys, and a growing tendency toward municipal ownership of power and light plants in the Southwest mark the activities of the last two weeks in things electrical.—The Editor.)

THE PACIFIC NORTHWEST

PORTLAND, ORE.—Sherman County Light & Power Company has incorporated.

SPOKANE, WASH. — The Reilly-Harness Telephone Company has been incorporated here.

MARSHFIELD, ORE.—The Sitka Spruce Company has contracted for a full electric lighting and power system.

OROVILLE, WASH —An ordinance granting a fifteen-year franchise to the Okanogan Valley Power Company has been passed by the council.

SEATTLE, WASH.—Pacific Machine Shop & Manufacturing Company, Seattle, has the contract for installing electrical winches on 14 wooden ships.

McMINNVILLE, ORE.—Efficiency aid service will be the slogan of the municipal electric plant at McMinnville as the result of repairing the entire plant on Baker Creek and the installation of new machinery.

LACONNER, WASH. — LaConner and vicinity have raised $21,000 for construction of a power line from Mount Vernon. The line will be constructed by the Puget Sound Traction, Light & Power Company.

SEATTLE, WASH.—The War Department has awarded a contract to the Aero Alarm Company of Seattle for the installation of aero automatic fire-alarm systems in 330 buildings in 16 National Army contonments.

VANCOUVER, B. C., CANADA.—It is reported that the Grandy Consolidated Mining, Smelting & Power Company, Ltd., is to spend more than $1,000,000 in the purchase of coal lands in the Nanaimo district of British Columbia.

WASHOUGAL, WASH. — The Northwestern Electric Company has applied to the County Commissioners for an extension of its franchise privilege to supply electricity in the eastern part of the county near Camas and Washougal.

SHELTON, WASH.—The Puget Sound Pulp and Power Company, which proposes the construction of a large paper mill near Port Angeles, has applied to the Mason County commissioners at Shelton for a 50-year franchise for a power line.

WILBUR, WASH.—The council will receive bids up to Nov. 21st at 7:30 p.m. for a double head type siren, equipped with electric motor for A.C. current, 60 cycle 115 volts. Certified check for five per cent of bid, payable to town clerk, required.

BEND, ORE.—A 600 horsepower generator has arrived in Bend and will be installed in the third unit of the Bend Water, Light & Power Company's plant now nearing completion. An estimated expenditure of $35,000 is involved in the new equipment.

SEATTLE, WASH.—The General Electric Company was low bidder for the motor generator desired by the city at $7893 and the Standard Underground Cable Company was awarded contract for 1500 feet of mill cable for the lighting department at $1789.

VANCOUVER, WASH.—NePage McKenny Company, electrical engineers and contractors with offices in Seattle and other coast cities, have the contract for complete electrical equipment in the school for the blind being erected by the state at Vancouver.

BAKER, ORE.—J. W. Riggins, who is one of the largest wheat ranchers in the valley, is advertising for bids for the construction of four miles of irrigation ditches which will comprise a part of the elaborate irrigation system he is to install, including a modern pumping plant.

GOLDENDALE, WASH.—The Board of County Commissioners of Klickitat County has granted to the Pacific Power & Light Company a 50-year franchise to erect poles and wires for the transmission of electricity for all purposes along the county roads and streets in White Salmon and its vicinity.

EVERETT, WASH.—Burns & McDonald of Kansas City will be instructed by the city council to compile data regarding the cost and work to be done on the Sultan river for a power plant, so that it may be laid before the commissioners, who are contemplating a special election to put the matter before the people.

TACOMA, WASH.—H. F. Gronen, commissioner of light and water, has requested the city attorney to frame an ordinance for introduction in the city council, providing for an issue of $4,000,000 worth of utility bonds for the purchase of a power site. It is reported that the ordinance will be introduced without delay.

NORTH YAKIMA, WASH.—Owners of 2000 acres lying above the Sunnyside Canal north of Prosser at a recent election approved the proposal of the Government to install a pumping plant there and put the land under irrigation. The estimated cost is $220,000 and an appropriation of $250,000 is available for the work.

VICTORIA, B. C.—The Kootenai Power Company has announced that it will spend $2,500,000 in building a high tension power line from the end of its Boundary system in the vicinity of Greenwood and west as far as Copper Mountain. The power company will also extend a power line to Penticton for industrial purposes.

EVERETT, WASH.—A 30-month priority right on the waterpower of the Sauk-Suiattle river in Washington has been granted to the American Nitrogen Products Company, Securities Building, Seattle. It is proposed to erect the first unit of the nitrate plant at Darrington. Three units are contemplated at an estimated cost of $6,500,000.

PRINEVILLE, ORE.—Extensive improvements on the Ococho and Canyon Creek road from site of the proposed dam of the Ococho Irrigation district to the Wheeler county line have been authorized by the county commissioners. Improvements involve expenditure of about $40,000 and will be made under the supervision of the state highway commission.

SEATTLE, WASH.—The Nitrogen Products Company, Securities Building, which has a large plant in operation at La Grande, now has three crews of 12 men each making surveys for a railroad to bring materials to the site of its proposed $3,000,000 dam it is to construct at the falls on the north fork of the Sauk river, 14 miles from Bedal's. Extensive borings are now being made for foundations for the huge structure.

HELIX, ORE.—An improvement requisition has been authorized by the Pacific Gas & Electric Company for the construction of a 6600-volt three-phase line to Helix. The present equipment at Adams besides being single-phase is insufficient to take care of the additional load and therefore will be removed from service. An outdoor substation will be built at Adams using two 100-kw. 23,000-2300-volt and three 50-kw. 2200-6600-volt transformers from Flavel with the necessary current controlling and switching equipment.

SEATTLE, WASH.—Bids have been called for by the state board of control, O. A. Torgerson, secretary, Olympia, Wash., to be opened December first, for the construction of a power plant at the state school for girls at Grand Mound, Wash., estimated to cost about $40,000. Figures will be received for the general contract, heating and central power plant, plumbing contract, wiring and installation of generator set. Plans may be obtained from Heath & Gove, Tacoma; Julius Zittel, Spokane and G. W. Lawton, Alaska Building, Seattle.

SEATTLE, WASH.—The city council has passed an ordinance providing for the issuance of $40,000 utility bonds for the extension of Division A to Market street and Leary avenue. An ordinance was also introduced transferring $35,000 from the general fund to the municipal railway construction fund 1917 in addition to the $20,000 already transferred from the general fund. This indicates that it is not the intention of the council at present to rely on the sale of bonds to extend the road. The council committee of the whole recommended the passage of the ordinance transferring the $35,000 and the council accepted the report, voting the action be deferred until the next meeting.

THE PACIFIC CENTRAL DISTRICT

EUREKA, CAL.—The city will soon call for bids for city lighting.

GILROY, CAL.—The town of Morgan Hill is considering installing an electric plant of its own.

AUBURN, CAL.—Lora J. Moore of Tahoe City has secured a water right of water of Slim Jim Creek, tributary to Lake Tahoe, for supplying electrical power.

NAPA, CAL.—Merchants and taxpayers have sent to the State Railroad Commission a protest against the granting of a 100 per cent raise in gas rates to the Pacific Gas and Electric Company.

EUREKA, CAL.—The Eureka division of the Western States Gas & Electric Company has completed laying its 11,000-volt cable across Humboldt Bay to supply electricity to shipyards and other industries in that district.

HANFORD, CAL.—Within a short time the People's Ditch Company will install, at the headgate of the irrigation system, an electric light and power plant. A string of lights will be placed across the river above the dam.

SAN FRANCISCO, CAL.—The Western States Gas & Electric Company board of directors has declared the regular quarterly dividend of 1¾ per cent on the preferred stock of the company, payable Oct. 15 to stockholders of record Sept. 29th.

MERCED, CAL.—The proposition of municipal management of the city's light system promises to develop into a definite issue. The city trustees, after some investigation into the matter, plan to bring up the question at their next regular meeting.

SAN FRANCISCO, CAL.—The Gas and Electric Sales Company has been incorporated here with a capital stock of $40,000. The subscribers and directors: Thomas Steel, Berkeley, Cal.; M. J. Purcell, V. A. Kuehn, Lee M. Olds, A. C. Duerr, of San Francisco, one share each.

FRESNO, CAL.—Representing an expenditure of $60,000, the San Joaquin Light and Power Corporation has purchased the Merced Stone Company's plant and power lines at Kittridge, Mariposa county, and will extend the power lines to several mining claims, as well as Coulterville.

AUBURN, CAL.—The Pacific Gas and Electric Company announces that the two ends of the long tunnel through the hill near Newcastle met, after several months' work. It will take about a month to complete the bore, and in that time the canal and other work will also be completed.

OAKLAND, CAL.—The Peninsular Railway has asked the Railroad Commission for permission to build a track at grade from its track on University Avenue extension, near Palo Alto, across the westerly side of University Avenue extension and across a spur track of the Southern Pacific Company.

NAPA, CAL.—The Board of Supervisors awarded the contract to install electric lights in the new Hall of Records to Meyberg Company of San Francisco on their bid of $646. The other bidders were Earl G. Wilson, $768, J. W. Butcheal, $936. Fixtures are to be installed under supervision of Earl Wilson.

FORT BRAGG, CAL.—Exhaust steam from the power plant of the Union Lumber Company, which represents a large amount of energy lost, will soon be utilized to run a pressure turbine generator capable of producing 750 kilowatts of electricity. This will put them in better position to furnish lights to Fort Bragg.

SAN FRANCISCO, CAL.—The next quarterly dividend on the common stock of the Pacific Lighting Corporation, which is payable November 15 to stock of record November 1, will be at the rate of $3 per share, or 12 per cent per annum. Heretofore the company has paid $2.50 quarterly, or 10 per cent per annum.

CHICO, CAL.—The intersection system of lighting has been decided upon by the board of trustees. The trustees will call for bids on the new system. It is understood that the Pacific Gas and Electric Company will not bid and that the rate of $319 a month quoted by the Northern California Power Company will be accepted.

MERCED, CAL.—A growing demand for electricity for farm purposes around Merced necessitates a big increase in the capacity of the local substation of the San Joaquin Light and Power Corporation. Local agent Raleigh Casad says that plans are now under way for the extension of the capacity from 1200 kilowatts to twice that measure.

SAN FRANCISCO, CAL.—The lighting of San Francisco's "Triangle District" is to be completed by December 15. The initial cost of installation will be at least $85,000. Electric current alone will cost $30,000 a year. The money needed has been raised by private subscription on the part of merchants and property owners in the district that is to be lighted.

SAN FRANCISCO, CAL.—The Roberts Manufacturing Company submitted the lowest bid to the Board of Public Works for furnishing and installing lighting fixtures in the northeast wing of the San Francisco hospital at $6216. Bids were also opened by the board for the electric work in connection with the yard work at the hospital and a contract will be awarded within the next few days.

REDDING, CAL.—The Pacific Gas & Electric Company has shut down its work in the Big Bend of Pit River almost completely. One hundred and fifty men employed at Intake and Cove, the two ends of the seven mile tunnel under construction, have been laid off. Only fifteen men are left on the job that is to cost $17,500,000 to complete. The company explains that the shutdown is due to the difficulty of getting supplies into the Big Bend during the winter.

NEVADA CITY, CAL.—The big power plant at Rome, on the South Yuba river, the first plant of the South Yuba Power Company, predecessor of the great system of the Pacific Gas & Electric Company, is being scrapped. The plant is situated in an unaccessible place and hoists are necessary to lift the material to the bluff above. It is stated that the electrical appliances are bringing more as scrap than they cost new nearly twenty years ago. The plant is superseded by other plants of the same system.

OAKDALE, CAL.—Report on the use of storage water in two districts was made to the Oakdale board, by Engineer Griffin of the South San Joaquin district at a meeting last week. Mr. Griffin visited the reservoir with power company superintendent G. R. McDonald and told of the condition of various reservoirs. Mr. Griffin recommended that the district install current meters and also permanent wires at the Stan-

islaus power house, and at the mouths of the north and south forks of Stanislaus River.

MOKELUMNE, CAL.—What is said to be the second largest irrigation project ever planned in California is to be built in the watershed of the Mokelumne River and the Dry Creek section, according to filings for water rights which have just been made with the state water commission. The project contemplates the reclamation of lands in Amador, Sacramento and San Joaquin counties, a tract of 240,000 acres. The consulting engineers are Duryea, Haehl and Gilman of this city. The contemplated project is to cost $10,500,000 and will require about twelve years to complete.

THE PACIFIC SOUTHWEST

PHOENIX, ARIZONA.—The Ray Electric and Telephone Company has been incorporated here.

MANHATTAN BEACH, CAL.—A resolution of Intention has been adopted by the city trustees for the lighting of the Strand.

DOUGLAS, ARIZ.—The Douglas Traction & Light Company is contemplating building an extension to Pirtle in the near future.

OROVILLE, CAL.—The owners of the Bloomer Hill quartz mine, a famous producer of earlier days, plan the erection of a hydroelectric plant.

LOS ANGELES, CAL.—The contract for installing an ornamental lighting system in Walnut Park lighting district has been awarded to D. A. Tamplin.

SAN DIEGO, CAL.—The Electric Supply Company has been incorporated here by C. H. Heilbron, August H. Biewener, S. L. Hall, R. J. Zing and E. V. Winnek.

TAPCO, ARIZ.—The new electric plant of the Arizona Power Company in Tapco has been started, assuring an adequate supply of power for mining interests around Jerome.

PLACENTIA, CAL.—An election held for the purpose of curing a defect in the original organization of Placentia Lighting District resulted in a unanimous vote in favor of the same.

BRAWLEY, CAL.—A resolution has been passed by the city council instructing the city engineer to report upon the feasibility and probable cost of the installation of a municipal electric plant.

LOS ANGELES, CAL.—The Hammond Electric Protection Company has been incorporated here with a capital stock of $250,000, by W. D. Hammond, C. E. Rees, W. I. Gilbert, F. C. Mason and B. N. Hammond.

VENICE, CAL.—Petitions are being circulated in Venice, Cal., asking the "powers that be" to act for a one-telephone system in that city. The Santa Monica Bay Merchants' Association is fathering the movement.

PASADENA, CAL.—The city commission have decided for the city not to purchase the physical plant of the Southern California Edison Company or tie itself up to the proposed thirty-year contract, to jurchase power.

SAN DIEGO, CAL.—It is claimed that the line of the La Jolla Beach Railway is to be electrified soon. Until an electric line, operating on an adequate schedule is established, an auto bus line will ply between Lo Jolla and San Diego.

CALEXICO, CAL.—The electric light plant, owned and operated by the northern district of Lower California, is the latest project to be set on foot in Mexicali. Meetings are being held daily and a definite announcement of the plans is expected soon.

SNOWFLAKE, ARIZ.—Steps have been taken to organize a company to install an electric light and power plant to supply electricity in Snowflake and Taylor. The company will be capitalized at $50,000. The stockholders of the Snowflake & Taylor Irrigation Company are interested in the project.

LOS ANGELES, CAL.—The Los Angeles Railway Company has agreed to build a spur line to the new Los Angeles High School. The extension will be built up Tenth street, thence through a short private street in Bowers Tract to Country Club drive, and will terminate within a block of the school.

LOS ANGELES, CAL.—A merger of the telephone companies in Glendale, Burbank and the adjacent territory in Los Angeles county is proposed in a petition filed with the State Railroad Commission by the San Fernando Valley Home Telephone Company and the Pacific Telephone and Telegraph Company.

SANTA BARBARA, CAL.—The city council has instructed the city engineer to procure data and prepare estimates of the cost of utilizing certain water projects for developing power. The estimated cost of the proposed Mission Canyon power plant is $146,368 and for a plant at Gibraltar dam, $66,000.

MAGDALENA, N. M.—The Reserve Long Distance Telephone Company, which operates in Socorro county, New Mexico, is now installing a telephone line which will extend from Reserve to Magdalena by way of Datil; also from Datil to Quemado in the northern section of the county. The central office will be situated in Reserve.

TUCSON, ARIZ.—According to a report of the city engineer to the city council, it would cost about $17,600 to light the new paved streets here. About 168 one-light standards will be needed and 16 five-light standards. It was decided to delay the matter a few months on account of present high cost of materials and the difficulty of obtaining delivery.

SAN DIEGO, CAL.—It is reported that the San Diego and Southeastern Railway Company is considering plans for building an electric railway into the Mountain Empire from the present terminus at Lakeside to Santa Ysabel, at the foot of Julian grade. It is said that considerable work has already been done in the matter of securing rights of way for the line.

VENTURA, CAL.—Sealed bids will be received by the city clerk up to Nov. 19th, for the construction and installation of ornamental street lights in Street Lighting District No. 1, in accordance with specifications and plans for said work on file in the office of the city clerk and city engineer. Said work consists of installation of 52 ornamental concrete street lights.

LOS ANGELES, CAL.—Surveys have been made for improvements in the Pacific Electric Railway Company's roadbed on Santa Monica Boulevard in Sawtelle that mean an outlay of $130,000. New and heavier rails will be laid the entire distance from the westerly to the easterly city limits, and the roadbed given a heavy rock ballasting and paved with oil and macadam.

KINGMAN, ARIZ.—That the giant dam across Colorado River at Diamond Canyon will be built as soon as war conditions become settled is the belief of E. H. Carpenter, who has been engaged in making hydrographic prints for the eastern capitalists proposing to build the project. The plan is to construct the big electric plant to generate electricity for the whole of northwest Arizona.

ESCONDIDO, CAL.—Surveyors are now staking out a route and securing easements for an electric power line into San Pasqual valley. The plan of the San Diego Consolidated Gas & Electric Company, builders of the line, is to install the improvements within the coming two months if possible. The line will be a pole, copper wire circuit, three-phase and capable of handling a big business.

LOS ANGELES, CAL.—The executive committee of the People's Power Bond Committee has given consideration to the advisability of having a power bond election in the near future, also to the proposed power agreement between Los Angeles and Pasadena to supply the latter with aqueduct power. It was the consensus of opinion that the present is no time to submit a bond proposition. No definite plan has been outlined.

YUMA, ARIZ.—At a regular meeting of the city council the members unanimously passed a resolution instructing the city recorder to communicate with F. E. Trask of Los Angeles and have him endeavor to obtain an option on the existing water, power, light and gas plants in Yuma, as a basis for an action in the direction of municipal ownership. The council has virtually decided to call an election for the voting of bonds to the sum of $300,000 for the purpose of purchasing the old plants, or installing new ones.

INTER-MOUNTAIN DISTRICT

ARROW CREEK, MONT.—The Stanford Northern Telephone Company has incorporated here.

BOISE, IDA.—The city council has authorized an issue of $1800 in bonds for the Harrison Boulevard lighting district.

MALTA, MONT.—Geo. W. Kemper, Minot, has been awarded contract for installing electric light system at $39,000.

MOORE, MONT.—Montana Power Company is starting the development of a large power project in Stillwater county at the foot of Mystic Falls.

GREAT FALLS, MONT.—The Montana Power Company will erect a modern downtown substation of brick and concrete to cost about $150,000 to $175,000.

DENVER, COLO.—The Colorado Power Company has sold to Denver bankers $100,000 of 7 per cent cumulative preferred stock, which is being offered at par and dividends.

HELENA, MONT.—The Montana Power Company will construct a substation at Great Falls, Mont., at a cost of about $150,000. The building will be of fireproof construction, 90 x 148 feet.

MONTICELLO, UTAH.—The Blue Mountain Irrigation Company is contemplating an issue of $60,000 in bonds, it is reported, the proceeds to be used for improvements to its light and water plant.

POPLAR, MONT.—The Mr. Thomas who recently took over the lighting plant at this place reports that he was unable to secure the necessary equipment and will be unable to make the extensions planned.

CARSON CITY, NEV.—Attorney General Thatcher has filed a complaint in the Supreme Court of Nevada asking that the Reno Traction Company, which operates a street car system, be deprived of its franchise for neglect to repair the streets.

OGDEN, UTAH.—At a session of the City Commissioners recently the application of the Utah Light and Power Company for a pole line through a portion of Glenwood was recommended by Commissioner Miles L. Jones and adopted by that body.

OGDEN, UTAH.—Automatic Controller & Manufacturing Company has been organized with a capital of $100,000. The company will manufacture electrical machinery. Cleveland Redfield is president; J. W. O'Brien, vice-president; William Stone, secretary, and Thomas L. Whitehill, treasurer.

WHITEFISH, MONT.—A. P. Tills, of Kalispell, a representative of the Northern Idaho and Montana Power Company, circulated a petition to property owners here for the purpose of installing a better lighting system. It is proposed to put lights at all street corners and intersections of streets and alleys.

GRANGEVILLE, IDA.—Work is progressing rapidly on excavation for the dam which the Grangeville Light & Power Company will build across the South Fork of the Clearwater river, at a point between the power house and the present dam. Present calculations are that the dam, which will be of concrete, will be completed within six months.

SOUTH MISSOULA, MONT.—According to an announcement, surveys will be made this fall for an electric railway from South Missoula to Flathead Lake, Mont. This will be under the supervision of N. D. Miller, formerly chief engineer of the Great Northern Railroad. It is stated that the electric railway will connect with the big ferry boats to be operated by the Flathead Lake Hotel Company.

BOISE, IDA.—Idaho Electric Company, which has heretofore been a Salt Lake City concern, has now become a strictly Boise (Idaho) company, a group of the employees who have been connected with the store for several years having purchased the Salt Lake interests. S. Gwaitney is president of the new company and L. R. Walker, secretary. The firm has been transacting business in Boise for twelve years.

ELY, NEV.—A hydroelectric development plan, destined to provide power to the huge copper mines at Ely and its vicinity, has been submitted to Commissioner of Corporations H. L. Carnahan for his approval. Frank B. Ench of Oakland is behind the project and announces that the initial installation of 4800 horsepower of electrical energy will entail an expenditure of $1,200,000. The company expects to be furnishing at least 10,000 horsepower within three years.

BUTTE, MONT.—In a report to the mayor and city council the city electrician recommends the complete reorganization of the city lighting system. The city is still using the same style of lamps in the residence section that was in use 15 years ago. He also recommends that the city secure an estimate for maintenance on 400-cp. 15-amp. Mazda lamps from the Montana Power Company, to be operated on the company's lines, and that the city purchase 470 Mazda pendent lamps, to replace the old-style carbon lamps now in use. New lamps, it is estimated, will cost $6,500 installed.

LOVELAND, COLO.—The municipal lighting proposition has again become active, through the action by city council in authorizing council's light committee to proceed with sale of bonds authorized at a special election held a year ago and the completion of lighting plant and distributing system. This step follows closely on refusal of Western Power & Light Company to sell its distributing system to the city on any terms short of a 10-year contract to furnish the city with all current required for maintenance of the system. The next step toward completion of plant will be the building of a pipe line, which is to carry water for the generation of power to a point above the plant. A dam has been constructed.

SALT LAKE CITY, UTAH.—A complete schedule was filed with the State Public Utilities Commission by the Mountain States Telephone and Telegraph Company. An accompanying letter says that the tariffs given as being in effect at Milford are not as yet in force and will not be until the new exchange building there shall have been completed. At that point the business rate is to be increased from $36 to $42 per year, and that the new two-party line tariff will be $36 annually.

DENVER, COLO.—Acquisition of the business of the Boston-Colorado Electric Company, competitor of the Colorado Power Company in the Idaho Springs district, is reported by the Colorado Power Company. The Colorado Power Company acquired only that part of the distribution system which was necessary for carrying on the business. Lines duplicating the system already operated by the Colorado Power Company were removed.

SALT LAKE, UTAH.—The Unitah Basin Construction Company has been incorporated for $100,000 to take over the Myton Canal & Irrigation improvements to water 60,000 acres of land, in four parcels, in the Unitah basin. The company is being financed by Zion's Savings Bank & Trust Company. There have been homesteaded 40,000 acres of this land since it was thrown open for entry in September. There are from 500 to 800 farmers under the project, which is at an altitude of 5000 feet, the entire acreage being bench land. There is said to be 600,000 acre feet of water available.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page following

A-1 American Ever-Ready Works of National Carbon Co
Los Angeles; 755 Folsom St., San Francisco; Seattle.

A-2 Associated Engineering & Supply Co.....
San Francisco, Southern Pacific Bldg., Los Angeles- Portland, Vancouver, B. C.

A-3 American Electric Heater Co.....
Detroit, Mich.

A-4 American Conduit Mfg. Co..... 23
(See Pacific States Electric Co.)

B-1 Baker-Joslyn Company.....2-3
71-75 New Montgomery St., San Francisco; 526 First Ave. South, Seattle; 353 Second St., Los Angeles.

B-2 Benjamin Electric Manufacturing Co.....
590 Howard St., San Francisco.

C-1 Century Electric Co..... 5
906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore.

C-3 Crocker-Wheeler Co..... 11
87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles.

C-4 Cutler-Hammer Manufacturing Co.....
579 Howard St., San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.

C-5 Crouse-Hinds Company..... 4
Syracuse, N. Y., U. S. A.
New York, Boston, Cincinnati, Chicago.

D-1 Detroit Fuse & Manufacturing Co..... 21
1404 Rivard Street, Detroit, Mich.

D-2 Davis Slate & Mfg. Co..... 20
Chicago, Ill.

D-3 Detroit Insulated Wire Co..... 22
71 New Montgomery St., San Francisco; 353 East Second St., Los Angeles; 526 First Ave. South, Seattle.

E-1 Edison Lamp Works of General Electric Co.....
Rialto Bldg., San Francisco; 724 So. Spring St., Los Angeles.

E-2 Edison Storage Battery Supply Co..... 9
206-8-10 First St. (near Howard), San Francisco.

E-3 Electric Agencies Co..... 5
279-283 Minna St., San Francisco; 419-421 E. Third St., Los Angeles; 1252 First Ave. South, Seattle.

E-4 Electric Storage Battery Co..... 20
1536 Bush St., San Francisco.

E-5 Electric Railway and Manufacturers' Supply Co..... 22
34 Second St., San Francisco.

E-6 Electric Controller & Mfg. Co., The.....
Cleveland, Ohio.

F-1 Faries Mfg. Co.....
Decatur, Ill.

F-3 Federal Sign System (Electric)..... 10
618 Mission St., San Francisco.

G-1 General Electric Co.....26-27
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G-3 Garland & Affolter Engineering Co..... 28
Rialto Building, San Francisco.

H-1 Habirshaw Electric Cable Co., Inc..... 11
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H-2 Hemingray Glass Co..... 22
236-240 So. Los Angeles St., Los Angeles; 345 Oak St., Portland; 807 Mission St., San Francisco.

H-3 Howell Electric Motors Co..... 28
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H-4 Hubbard & Co..... 24
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H-5 Hotpoint Electric Co.....
Ontario, Cal.

H-7 Hurley Machine Co..... 25
New York and Chicago. (See Pacific States Electric Co.)

L-1 Landers, Frary & Clark..... 19
150 Post St., San Francisco, and all jobbers.

L-2 Locke Insulator Manufacturing Co..... 10
(See Pierson, Roeding & Co.)

M-2 Moloney Electric Co.....
St. Louis, Mo.; Rialto Bldg., San Francisco.

M-3 Moore & Co., Charles C..... 20
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

N-1 Nason & Co., R. N.....
151 Potrero Ave., San Francisco.

N-3 National Lamp Works of G. E. Co..... 23
(All Jobbers.)

N-4 New York Insulated Wire Co.....
629 Howard St., San Francisco.

N-6 National Carbon Co..... 18
Cleveland, Ohio.

O-1 Okonite Co. (The)..... 28
(All Jobbers.)

P-2 Pacific States Electric Co..... 25
236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 570 First Ave. So., Seattle; 402 Paulsen Bldg., Spokane, Wash.

P-3 Peerless Electric Co..... 1
Warren, Ohio; Rialto Bldg., San Francisco.

P-4 Philips Wire Co. 22
Eighth and Santee Sts., Los Angeles.
84 Marcion St., Seattle; 807 Mission St., San Francisco;

P-5 Pierson, Roeding & Co..... 20
Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle.

P-7 Pittsburgh Piping & Equipment Co..... 28
Monadnock Bldg., San Francisco.

S-2 Society for Electrical Development..... 6
United Engineering Societies Bldg., New York City.

S-3 Sangamo Electric Company.....
Springfield, Ill.; San Francisco, 37 Stevenson St.; Los Angeles, San Fernando Bldg.

S-4 Southern Pacific Co..... 8
Southern Pacific Bldg., San Francisco.

S-5 Sprague Electric Works..... 20
Rialto Bldg., San Francisco; Colman Bldg., Seattle; Corporation Bldg., Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane.

S-6 Standard Underground Cable Co..... 18
First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Central Bldg., Seattle, Wash.; 815 Newhouse Bldg., Salt Lake City, Utah.

T-1 Thomas & Co., R.....
Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives.

T-2 Tubular Woven Fabric Company..... 2
Pawtucket, R. I.

V-1 V. V. Fittings Co..... 3
Philadelphia. (See Baker-Joslyn Co.).

W-1 Wagner Electric Manufacturing Company.....
St. Louis, Mo.

W-2 Western Electric Co.....
Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 84 Marion St., Seattle; 45 North Fifth St., Portland, Ore.

W-3 Ward-Leonard Electric Co.....
Mt. Vernon, New York.

W-4 Westinghouse Electric & Manufacturing Co.... 13-14
50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; First National Bank Bldg., San Francisco; Second and Cherry Sts., Seattle; Paulsen Bldg., Spokane.

W-6 Westinghouse Lamp Co..... 12
(See Westinghouse Electric & Manufacturing Co.)

W-8 Western Pipe & Steel Co.....
444 Market St., San Francisco; 1758 North Broadway, Los Angeles.

W-9 Weston Electrical Instrument Co.....
109 Weston Ave., Newark, N. J.; Frank E. Smith, 682 Mission St., San Francisco.

Y-1 Youngstown Sheet & Tube Co..... 5
Youngstown, Ohio. (See Electric Agencies Co.)

JAVA
COCOS IS.
DIAN
CEAN